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THIRTEENTH ANNUAL REPORT OF THE DIRECTOR OF THE BUREAU OF SCIENCE

PHILIPPINE ISLANDS

TO THE HONORABLE
THE SECRETARY OF THE INTERIOR

BY

ALVIN J. COX
DIRECTOR OF THE BUREAU OF SCIENCE

FOR THE YEAR ENDING
DECEMBER 31, 1914

INCLUDING ESSENTIAL INFORMATION CONCERNING THE
SIX MONTHS ENDED DECEMBER 31, 1913

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THIRTEENTH ANNUAL REPORT OF THE DIRECTOR OF THE BUREAU OF SCIENCE

THE GOVERNMENT OF THE PHILIPPINE ISLANDS,
DEPARTMENT OF THE INTERIOR,
BUREAU OF SCIENCE,
Manila, January 1, 1915.

SIR: I have the honor to submit the following general statement of the work carried on in the Bureau of Science from July 1, 1913, to December 31, 1914, together with a few recommendations with regard to improvements and extension of the work which seem to me advisable. Since the calendar year 1914 is the first full fiscal year since the Philippine Legislature passed Act No. 2305 which changed the fiscal year to conform with the calendar year, I have included in this report an account of the work carried on in the Bureau of Science for the preceding six months, which has not been covered by any published report.

The Bureau of Science during its many years of existence has become very widely known all over the world. We have in the Philippines what the Britanica Year Book of 1913 in a biography of Dr. Paul C. Freer, late director of the Bureau of Science, calls "a great research institution that is now classed with the best in the world." The Bureau of Science has always been composed of capable and energetic men who have had a clear conception of what is to be accomplished, and the routine work of the institution, which has greatly increased throughout the last years, has been performed not as a goal in itself, but as a necessary part of the great work which must be achieved. A great volume of correspondence carried on in the name of the Bureau of Science by our various division chiefs and the Director has announced the accomplishments of the Government of the Philippine Islands in all parts of the globe, and has given to the Philippine Islands the benefit of extensive research carried on in other countries. Repeatedly the members of the staff of the Bureau of Science have taken a leading part in scientific conferences at which many great nations were represented. Frequently letters come to us from both friends and persons unknown to us in appreciation of the quality of the scientific work of this Bureau and the way in which we are publishing it.

During the period covered by this report a determined effort has been made by individuals who apparently have little knowledge of the Bureau of Science or the work to be performed by it to annex the Bureau along with the Philippine General Hospital to the University of the Philippines. When this plan failed, an attempt was made to unite the Bureaus of Science, of Forestry, and of Agriculture, and the College of Engineering of the University of the Philippines with the College of Agriculture of the University of the Philippines situated at Los Baños, three hours distant from Manila by train. All of the reasons which I have seen advanced for this combination are general statements unsupported by figures or evidence. As far as I am aware, persons most familiar with the situation have been much opposed to, and have discouraged, the efforts to combine activities so distinct as those of the institutions above mentioned. After an investigation by the Legislature, the question of uniting these institutions, as far as the Bureau of Science is concerned, has now been dropped. The Honorable, the Secretary of the Interior has carefully studied the operations of the Bureau of Science and has expressed himself as exceedingly pleased with its operations as shown by his letter of July 11, 1914, copies of which were given to the press.

THE UNITED STATES DEPARTMENT OF AGRICULTURE FOLLOWS THE EXAMPLE OF THE BUREAU OF SCIENCE

Previous to 1906 the Bureau of Science issued free a series of 36 bulletins and many other similar publications. It was recognized by the late Director of the Bureau of Science, as well as by many of his colleagues and by other scientific men, that a high-grade character could not be maintained in the Bureau publications when issued in this way, and in 1906 the Bureau ceased publishing its material in the form of bulletins and started the Philippine Journal of Science. The arrangement has been eminently satisfactory. A subscription price was charged to prevent waste and miscellaneous distribution and to effect economy, but the Journal has been sent to the leading scientific institutions in exchange for their publications which have become valuable additions to our library.

An article in Science of August 8, 1913, entitled "Publications of the Department of Agriculture" [Washington, U. S. A.], shows that the Department of Agriculture plans to follow the example of the Bureau of Science. It reads as follows:

> The Secretary of Agriculture has announced new plans of publication work for that department. There has been an independent series of bulletins and circulars in each of the thirteen publishing bureaus, divisions and offices of the department. These have been discontinued and will be

superseded by the Journal of Research for printing scientific and technical matter, and by a departmental series of bulletins, written in popular language for selected and general distribution. By this plan the confusion that has resulted from the multiplicity of series of publications will be avoided, and the saving of a considerable sum will annually be effected * * *.

The highly scientific matter heretofore published indiscriminately in bulletins and circulars will hereafter be published only in the newly established *Journal of Research*, which will be issued about once a month * * *.

The Journal will be distributed free to agricultural colleges, technical schools, experiment stations, libraries of large universities and certain government depositories and institutions making suitable exchanges; also to a restricted list of scientific men. Copies of the Journal will be sold to miscellaneous applicants by the superintendent of documents, Government Printing Office, * * *.

The new plan of publication work has been designed primarily to improve the character of the department's publications, and secondarily to prevent waste in distribution, and through the economies effected, a greater output of information will become possible with the available appropriation * * *.

UTILIZATION OF RESULTS BY THE BUREAU OF HEALTH

A noteworthy thing in the Annual Report of the Director of Health of the Philippine Islands for the fiscal year ending June 30, 1913, is the record of the extent to which the results of work of the Bureau of Science have been utilized by the Bureau of Health. The following instances quoted from my memorandum report of December 31, 1913, indicate the extent to which the routine work and researches of the Bureau of Science have contributed to the improved health conditions of the Islands, and show a few of the ways in which this work has been put into practical use.

A pamphlet entitled Insects and Diseases is used in public schools and will, no doubt, do much good in disseminating such information as that malarial fever is conveyed by definite kinds of mosquitoes, that filariasis is transmitted by another, etc. During the fiscal year 1913 the Bureau of Science examined 23,450 samples of blood for malarial parasites and similar organisms, and during the last six months the scope of this work has been extended.

The Bureau of Health circular formerly issued on dysentery has been revised and rewritten, and its provisions now correspond with the more recent study made by the Bureau of Science in the prevention of this disease. The work of Doctor Walker of this Bureau upon amœbic dysentery is epoch making. Another pamphlet was prepared on beriberi which has awakened the public to the fact that beriberi occurs among those who use polished rice as a staple article of diet. The work of Doctors Strong and Crowell and of Mr. Williams, of the Bureau of Science, and of others, including the United States Army Board for the study of Tropical Diseases as They Exist in the Philippine Islands, here manifests itself. An illustrated pamphlet on The poisonous fishes of the Philippines, which has been issued by the Bureau of Health, was written by Mr. Seale of the section of ichthyology of the Bureau of Science.

The diagnostic work connected with the examinations for communicable diseases referred to on page 11 of the report of the Director of Health in the regulation of dance halls is carried on by the Bureau of Science. During the last fiscal year we examined 20,522 samples for gonococci.

The Manila milk supply is referred to on page 14. All of the native as well as imported milks are inspected and analyzed in the Bureau of Science, and a comprehensive investigation of the milk of the carabao by Mr. Dovey, of the chemical laboratory of the Bureau of Science, has been published. A tabulation of the composition of cows' milk imported into the Philippine Islands, sterilized milk, condensed milk, fat-free condensed milk, and other forms of milk by Mr. Agcaoili, of the Bureau of Science, has been published.

On pages 16, 35, 65, etc., the food and drug inspection is mentioned. The Food and Drugs Board of the Philippine Islands is a body appointed by the Governor-General, and consists of the Assistant Director of Health, the chief of the division of organic chemistry of the Bureau of Science, the chief appraiser of the port of the Bureau of Customs, and the chief city agent of the Bureau of Internal Revenue. This board is advisory to the Director of Health. All the work accomplished by this Board, whether prosecutions or the issuing of decisions relative to food and drugs found upon the market or imported into the Philippine Islands, originates in the Bureau of Science where all analytical work necessary for the enforcement of the Food and Drugs Act and for the examination of food and drink for sale in Manila is carried on.

On page 24 is mentioned the Maritime Quarantine which inspects immigrants for hookworm, intestinal parasites, amœbic dysentery, and even balantidic dysentery, cholera, etc. All of these diagnostic examinations are made by the Bureau of Science. During the last fiscal year we examined 34,530 samples of fæces in connection with this work, and for the period covered by this report the number has exceeded 24,000.

On page 25 the experimental work of the sterilization of water by the ultra-violet rays is mentioned. The idea originated in the Bureau of Science, the apparatus is now being installed in the Bureau of Science, and the work will be carried on and the apparatus operated by the Bureau of Science employees.

The character of the milk importation mentioned on page 26 is greatly improved, owing to the inspection carried on in the division of organic chemistry of the Bureau of Science which does the food and drug analyses.

Mosquito work mentioned on page 27 originated in the Bureau of Science, and this Bureau supplied the information necessary for the inspectors in carrying out the routine work.

Mineral waters of the Philippine Islands are mentioned on page 31 as follows:

The last Legislature by Act No. 2264, made available the sum of ₱15,000 for the purpose of studying the mineral waters of the Philippine Islands and at this writing the work is under way. Samples of water have already been secured and analyzed from all small springs known to the Bureau, and records and descriptions, real or alleged, of the properties of the waters are now being collected.

All of these analyses were made by the chemists of the Bureau of Science.

On page 43 the fly menace is mentioned. Whenever an epidemic of flies becomes very severe, the Bureau of Science is called upon to act and promulgate measures to abate the nuisance.

Regarding plague mentioned on page 51, all the examinations of rats are made in the Bureau of Science; nearly 60,000 were examined during the fiscal year 1913, and the work has been continued at about the same rate.

The vaccines and sera used by the Bureau of Health are manufactured and furnished by the Bureau of Science.

On page 93 health conditions at Baguio are discussed. Much work was done by members of the Bureau of Science in investigations in Baguio, tending to improve the health conditions. Concerning bacillary dysentery, much work has been done by Doctor Barber in Baguio.

With regard to cholera mentioned on pages 110 and 111, all the laboratory examinations were made by the Bureau of Science.

Much work referring to yaws discussed on page 131 has been done in the Bureau of Science. In fact, the Bureau of Science demonstrated that salvarsan was effective in the treatment of the spirochæte giving rise to yaws and that in the severe cases the disappearance of the lesions and the cures produced were almost marvelous.

FAR EASTERN ASSOCIATION OF TROPICAL MEDICINE

Dr. E. L. Walker, of this Bureau, was appointed by His Excellency, the Governor-General, as one of the delegates from the Philippine Islands to the third biennial congress of the Far Eastern Association of Tropical Medicine, in Saigon from November 8 to 15, 1913. The congress, like the previous ones, was well attended, and various tropical diseases were discussed. The stimulus of thought and the benefit derived from an organization of this kind is very great, not only to the delegates, but also to the institutions which they represent, especially in this part of the world where the scientific work is isolated to a great extent. The papers which were read treated of a great variety of subjects—dysenteries of different etiology, cholera, typhoid, plague, leprosy, animal parasites and parasitic diseases, beriberi, and tropical medicine and sanitation.

PHILIPPINE ISLANDS MEDICAL ASSOCIATION

The fourth annual meeting of the Philippine Islands Medical Association was held in Manila between the dates of November 5 and 7, 1914. The Bureau of Science was represented on the standing committees in scientific work, public policy and legislation, and exhibits. Important papers were read by Bureau of Science representatives on cholera, malaria, beriberi, leprosy, and the germicidal action of glycerol.

COMMITTEE ON STANDARDIZATION OF SUPPLIES

For several years the Bureau of Science has been endeavoring to create an interest in the subject of the standardization of supplies for Government use, and for some time all supplies such as khaki, rain coats, hats, and string, purchased for the Bureau of Constabulary, have been upon the basis of specification. I referred to the standardization of material purchased by the Government in my annual report for the fiscal year 1912, pages 2, 25, 26, 27, 50, 51, and 52, and in my annual report for the fiscal year 1913, pages 73 and 74. In each instance a remarkable increase in the quality has been noted after the purchase of supplies under specification has been thoroughly initiated, and this improvement in quality is usually secured without an increase of original cost. In the testing of materials and supplies, the Government of the Philippine Islands is far behind other progressive countries. The successful solution of many of our local problems concerning material for construction must be solved by local research, as available information on many of these subjects is meager and only a few general results are applicable to the Philippines. For example, protective coatings, paints, asphalts, dust preventatives, and iron and steel may give good service in some climates, but prove unsatisfactory in the tropics. In time, results obtained by studying the physical and chemical properties of various products, and materials in connection with their efficiency in actual service, will be of great value. From time to time I have pointed out the necessity for a new testing laboratory and an increase in our force and equipment. At the present time we perform, as well as we can with our equipment, physical tests of a great many materials, such as cement and other similar materials, concrete, mortar, building blocks, bricks, stones, reënforcing iron, steel, cloth, rope, wire, road material, and ties. On June 24, 1914, His Excellency, the Governor-General, issued Executive Order No. 62, which is as follows:

> E. G. Shields, Purchasing Agent; Warwick Greene, Director of Public Works; and Alvin J. Cox, Director of Science, are hereby constituted a permanent committee to be known as the Committee on Standardization of Supplies.
>
> It shall be the duty of the committee thus constituted, after studying the requirements of the various branches of the service, to establish certain makes, grades, qualities, or kinds of material and equipment as the standards of their class to be furnished for Government use.
>
> After the standards of any classes of material or equipment have thus been established, the Purchasing Agent shall furnish no others upon requisitions unless (1) specifically authorized by the Governor-General, (2) sanctioned by subsequent action of the committee, or (3) to admit of the disposal of material and equipment already on hand.

This is in reality an economic measure. The committee has collected specifications enforced in many places and has held one meeting at which it was determined that an effort would be made first to eliminate the inferior material and to systematize and classify office supplies. This work will proceed slowly, because in most instances it is necessary to devise special methods of analysis in order to select materials best suited to our needs.

MANUFACTURE OF EXTRACT OF TIQUI-TIQUI

Under the provisions of Act No. 2376 the Bureau of Science is charged with the duty of preparing extract of tiqui-tiqui for the experimental treatment of infantile beriberi. The actual work of preparing this extract has been under the supervision of the chief of the division of general, inorganic, and physical chemistry, who has modified and improved the methods of preparation. This work is of great practical importance, a view which we believe will be fully borne out by the report of the committee created by Act No. 2376 to supervise the distribution of the remedy and to collect the statistical evidence relating thereto. Up to the close of the year, in spite of some untoward circumstances, such as a fire in June which burned the products under preparation, 58 liters of extract have been prepared, probably sufficient to treat 700 infants.

REDUCTION OF STAFF

The uncertainty due to pending legislation in the United States with regard to the Philippine Islands has led many employees of the Philippine Government to seek employment elsewhere, and there has been a larger number of resignations from the Bureau of Science than usual. On August 22, 1914, his Excellency, the Governor-General, issued the following order:

> To all Chiefs of Bureaus and Offices:
>
> On account of the situation arising from the European war, there is urgent necessity for renewed efforts toward economy * * *. It is directed that every effort at economy be now put forth, and to this end no positions now vacant should be filled; no promotions in the service should be made; and no purchases of supplies, except such as are imperatively required, should be made * * *.

The many resignations and the impossibility of filling vacancies has reduced the staff to such an extent that the work of the Bureau of Science has suffered seriously.

APPOINTMENT OF A DIRECTOR

The Assistant Director, who was appointed Acting Director in May, 1912, following the death of Dr. Paul C. Freer on April 17, 1912, and who has continued to direct the affairs of the

Bureau since that date, was appointed Director, Bureau of Science, on January 22, 1914.

The work of the Bureau has continued along the lines outlined in my preceding reports, so it seems unnecessary to go into details in this report. Miscellaneous questions will be treated under the discussion of the department of the Bureau to which they chiefly refer. However, I desire especially to express my appreciation of the coöperation and the devotion to their work of our scientists, who have made possible our great accomplishments in the face of many adverse circumstances.

BIOLOGICAL LABORATORY

Personnel.--Dr. E. L. Walker, chief of the biological laboratory, who went on leave in June, 1914, has resigned to accept a position as associate professor of tropical diseases in the Hooper Institute at San Francisco, and Dr. M. A. Barber has been promoted to his place. Dr. D. G. Willets, who went on leave in December, 1913, resigned to accept a position as technical assistant in the United States Public Health Service. Mr. Ariston M. Guzman returned from leave in the United States on July 21, 1914. The position rendered vacant by the resignation of Mr. Porter D. Leaky in the Philippine General Hospital laboratory was filled by the assignment of Mr. Theodore Bolanes, an assistant in the routine laboratory. The resignation of Mr. Bolanes was accepted on August 4, 1914, and Mr. L. D. McMillan was dropped owing to legislative action. A temporary assistant who resigned has not been replaced. Dr. Liborio Gomez was transferred to the Bureau of Constabulary in August, 1913, and Dr. J. D. Jungmann was appointed as assistant in the laboratory and assumed his duties in the same month. The latter was assigned to duty in the clinical laboratory of the Philippine General Hospital. One routine assistant was summarily dismissed for cause.

ROUTINE WORK

Owing to resignations, the courses heretofore given by members of the staff on protozoölogy and medical entomology in the College of Medicine and Surgery of the University of the Philippines are no longer conducted. At present the scheduled course on immunity is given in the Graduate School of Tropical Medicine and Public Health.

The outbreak of cholera caused a large increase in the amount of work performed in the routine laboratory and necessitated the employment of additional assistants. The Bureau has had the services of Hospital Sergeant Edward Theurick, United

States Army, and First Class Hospital Apprentice Hugh Lane, United States Navy.

Since September the Philippine General Hospital has undertaken to perform its own laboratory work, and in consequence the routine examinations have been reduced in number along certain lines. Since August 3 Bilibid Prison has also been handling most of the routine work there. These reductions have been more than offset by the extra number of examinations entailed by the presence of cholera. Four men were constantly employed on this duty, and much overtime work was carefully and faithfully performed. During the flood in September, when practically all transportation was suspended, a sufficient number of the staff were on duty and the examinations for cholera went on uninterruptedly, a fact which speaks well for the esprit du corps.

The war in Europe has interfered with our source of supplies, and the laboratory has had great difficulty in securing sufficient bacteriological glassware for the cholera work. The Department Surgeon, United States Army, very kindly furnished such supplies as he had; and although very much restricted and hampered, up to this date we have been able to take care of all important work without much delay. The routine clinical, bacteriological, and pathological examinations have continued to increase, and those made during the fiscal year 1913, the six months from July 1 to December 31, 1913, and the calendar year 1914 are given in parallel columns in the following table:

Nature of examination.	Twelve months ended June 30, 1913.	Six montns ended Dec. 31, 1913.	Calendar year 1914.
Fæces	24,530	24,502	126,022
Sputum	5,770	1,919	2,095
Blood	23,450	8,780	6,398
Blood culture	226	185	392
Widal test	388	316	599
Wassermann test	727	798	1,288
Leprosy	848	243	1,142
Urine	6,974	5,309	4,275
Gonococci	20,522	8,541	16,383
Water	1,077	1,211	2,118
Autopsy	130	142	412
Histological examination	606	322	181
Rabies	11	14	35
Plague	45	13	64
Rats for plague	(a)	27,564	113,337
Miscellaneous	57,916	796	1,649
Total	153,220	80,655	276,390

[a] Included under miscellaneous.

INVESTIGATION

So much of the time of the staff has of necessity been required for routine examinations that only one man has been regularly engaged in research work. Nevertheless considerable important work has been accomplished.

Every piece of research that is intelligently chosen and is prosecuted by a capable investigator must contribute to our scientific knowledge. Although the practical importance of the results as measured by pesos or human lives may not be immediately apparent, they may later prove to be of vast benefit to mankind. The discovery by Theobald Smith in 1892 that Texas tick fever was transmitted by the bite of the cattle tick may not have appeared at that time to be of great practical importance; yet it disclosed the principle of the insect transmission of tropical diseases, which has enabled medical science to control malaria, yellow fever, and other diseases, and has rendered possible the construction of the Panama Canal, which had failed previously on account of the great mortality from these diseases in the Canal Zone.

All of the enumerated researches carried on in the biological laboratory during the period covered by this report have practical results which are immediately apparent. Investigations in progress include the following:

Cholera.—An interesting series of studies as to the viability of *B. choleræ* in water under ordinary conditions of light and temperature is being carried on. Another investigation deals with the irritability of the cholera bacillus under certain conditions.

Malaria.—An experimental determination of the distribution and the species of the mosquitoes capable of transmitting malaria in the Philippines is in progress. Several species have been definitely identified as "carriers," and the result of this work will contribute greatly to the sanitary improvement of these Islands, and will afford a great financial saving in any campaign against malaria. The health authorities of the Canal Zone estimated that from $150,000 to $200,000 were saved in their malaria campaign by the discovery that a certain anopheles mosquito that bred in the hollows of rotten stumps could not transmit malaria.

Tuberculosis.—Experiments on tuberculosis which were previously reported have been continued.

Leprosy.—The investigation on leprosy previously reported is still being carried on, and studies on the cultivation of *B. lepræ* have yielded promising results. In connection with the division of organic chemistry an investigation is now being conducted with a view to obtaining an active principle from chaulmoogra oil. Dr. John A. Johnston, of this Bureau, was appointed by the Secretary of the Interior as chairman of a committee to investigate a treatment for leprosy, and this work is still in progress.

Plague.—The routine work during the calendar year in examining 113,337 rats for plague has been enormous, and some facts previously unknown have been discovered. The routine examinations have served to confirm previous investigations of this laboratory with regard to plague.

Pathology.—The pathologist has performed 412 autopsies during the calendar year, mostly as diagnostic measures for the Bureau of Health. These have included such diseases as Asiatic cholera, bubonic plague, beriberi, malaria, tuberculosis, glanders, entamœbic and bacillary dysenteries, leprosy, diphtheria, tetanus, various tumors, and cases of trauma. Pathological specimens from the Philippine General Hospital, Bureau of Health, and from physicians in private practice to the number of 609 have been examined.

Sera and vaccines.—The following preparations were kept in stock and prepared in quantities sufficient to meet the demand: Antirinderpest serum, antidiphtheritic serum, antitetanic serum, anticholera serum, antiplague serum, antistreptococcic serum, serum for exophthalmic goitre, and normal horse serum. Other normal sera were furnished on request. In November, 1913, antimeningococcic serum was added to the list. Variola vaccine, mallein, plague vaccine, cholera vaccine, gonococcus vaccine, staphylococcus vaccine, typhoid vaccine, streptococcus vaccine, dysentery vaccine, anthrax vaccine, *B. coli* vaccine, tuberculin, and autogenous vaccines were furnished on request.

From July 1, 1913, to December 31, 1914, inclusive, 1,882 serum tests for syphilis were made and 398 specimens of blood were examined bacteriologically.

Rabies.—The work on rabies was continued and 163 patients received the Pasteur treatment.

ULTRA-VIOLET RAYS WATER-STERILIZING APPARATUS

The Bureau of Science purchased for the city of Manila a plant, consisting of one ultra-violet rays water-sterilizing apparatus type C–3, complete, with automatic valve and lamp and one rotary converter, with variable speed 110-volt direct current motor and generator field regulation, to deliver direct current with a range of from 50 to 250 volts. After many vexatious delays, the installation is now completed. The plant is of sufficient size to give results comparable with those of commercial procedure. In 1911 this Bureau placed a small ultra-violet light and quartz tube and working space in the Bureau at the disposal of the members of the United States Army Board for the Study of Tropical Diseases as they exist in the Philippine Islands. These gentlemen submitted amœbæ in the quartz tube to the effect of the ultra-violet rays, and the results of their experiments as published in the Philippine Journal of Science, Sec. B (1911), **6**, 383–94, are very satisfactory. The city of Manila desired that we continue this work on a commercial scale. It is probable, however, that the sterilizing plant will not eliminate bacteria entirely from unfiltered water, and recent experiments by Doctor Walker tend to prove that the amœbæ ordinarily found in water supplies are not injurious.

SECTION OF BOTANY OF THE BIOLOGICAL LABORATORY

Personnel.—The only changes in the personnel of the botanical section were those caused by the death of Dr. C. B. Robinson and the resignation of Mr. Paul W. Graff.

Doctor Robinson was murdered by the natives of Amboina on December 5, 1913, the first news reaching Manila on the 23d of the same month. The details of his death are already known to you, and it is certain that his unfortunate murder was entirely due to superstitious fear on the part of the natives who accomplished the deed. The guilty parties were soon apprehended by the Dutch authorities, and have been tried, found guilty, and sentenced. Doctor Robinson was one of our most capable, energetic, resourceful, and efficient men. His loss is a severe one to science as well as to this Bureau. As soon as possible after the news of this sad occurrence reached us, Mr. Merrill left for Buitenzorg, Java, in January, 1914, there to receive the botanical collections made by Doctor Robinson. All the collections were preserved, received in excellent condition, and brought to Manila, where the specimens have been arranged for study.

Mr. Graff's resignation was accepted at the end of his two years' contract, but he was retained as a temporary employee until the end of the school year because he had charge of one class in botany in the University. Mr. Graff left the service on May 14, 1914. Owing to lack of funds the position has not been filled in spite of the fact that the continuation of the mycological work is urgent. There are now only two botanists in the Bureau: namely, Mr. E. D. Merrill, chief botanist, and Dr. W. H. Brown, assistant botanist. With this depleted force the amount of scientific and economic work is more than commensurate with what was being done a year ago.

Routine work.—Mr. Merrill has continued, as in the preceding year, as associate professor of botany and acting chief of the department of botany in the University of the Philippines. Instruction has been given to a total of about 90 students in five courses; two of the courses have been under the personal direction of Mr. Merrill. Although he is detailed to the University for half time, during the present semester he actually spends in class work as many hours as full-time men. The depletion of the botanical force in the Bureau of Science made it necessary for Mr. Merrill to take over extra University work—work for which Mr. Graff of this Bureau was detailed last year—and thus to spend a large amount of time that could have been devoted profitably to botanical investigation. In addition to his work in the College of Liberal Arts, Mr. Merrill has also given a series of 10 lectures on medical botany to the students in the post-graduate medical course. Mr. Merrill is unusually energetic, and no doubt this work can be carried for a period of some months without seriously encroaching upon his regular work. However, it is manifestly impracticable for him to continue indefinitely devoting so much time to this work of instruction.

The nature and volume of the general routine work has continued to be about the same as for the preceding year, taxing our efforts to the utmost to accomplish the work with the present equipment and laboratory force. A considerable amount of the time of the mycologist was taken in reporting on diseased plants and parts of plants submitted by planters and others. Wherever possible, the fungus causing the trouble was determined and the remedy prescribed. In taxonomy the only group worked locally is the Basidiomycetes, all other fungi being submitted to specialists. The fungus *Metarrhizium anisoplioe* Sor., known as "green muscardine," which is parasitic on the coconut borer, has been isolated from specimens of the insect that had been killed by the fungus. Pure cultures of this parasite have been supplied to the government entomologist of German Samoa, to the mycologist of the Hawaiian Experiment Station, and to the Philippine Bureau of Agriculture for use in combating the pest.

The herbarium.—The burden of the herbarium work has fallen on the chief botanist since the assistant botanist is engaged in field work most of his time. A total of 10,730 Philippine and foreign specimens for the six months ending December 31, 1913, and 18,738 for the calendar year 1914 have been poisoned, mounted, and distributed into the herbarium. Approximately 14,186 and 24,622 duplicates, respectively, for the two periods have been distributed by exchange to various scientific institutions and to individuals. Additional duplicate material is prepared and packed for shipment, awaiting more favorable conditions. The accumulated material was all distributed into sets ready for distribution at the end of July, but a number of sets cannot be shipped until the close of the present war. Mounted sheets totaling 431 and 678 specimens, respectively, have been loaned to specialists for study. During the calendar year over 600 duplicate unmounted specimens have been sent to specialists for identification. Such a large volume of work was accomplished by so few men only by the careful and faithful performance of many hours of overtime work. It is physically impossible to continue this indefinitely, and a decrease in the amount of work accomplished must be looked for during the coming year.

Philippine accessions.—The total number of Philippine plants added during the past year is 6,137. These have been received from many sources, by collection, by transmission from other departments of the Government for identification, and as gifts. The important collections of Philippine material are:

	Six months ended Dec. 31, 1913.	Calendar year 1914.
Collections of employees of the Bureau of Science	2,250	1,744
Collections of employees of the Bureau of Forestry	582	2,113
M. Vanoverberg for identification	325	47
C. F. Baker for identification and fungi in exchange	87	619
C. A. Wenzel for identification	521	690
F. C. Gates for identification	161	135
L. H. Taylor for identification	116	
H. Sandkuhl for identification	63	
A. D. E. Elmer by purchase and gift	1,148	
D. L. Topping as gift		43
R. S. Williams by exchange with the New York Botanical Garden		291

Identifications made during the calendar year approximate 9,000, which include the unnamed Philippine material incorporated in the herbarium during the year, a considerable number of plants from Borneo and Amboina, a number of specimens for the College of Agriculture, and nearly 1,000 specimens submitted by the Silliman Institute.

Foreign accessions.—Extra-Philippine material received by collection, in exchange, and for identification has been greater than in any foregoing year. A total of 5,130 and 12,601 specimens for the six months ending December 31, 1913, and for the calendar year 1914, respectively, have been received, poisoned, mounted, and distributed into the herbarium. Many of the specimens are of the greatest value for purposes of comparison, and a large number of cotypes are represented in some of the collections, notably in the material received from the Paris Museum, the largest and most valuable single collection received during the year.

Total accessions.—The specimens added to the herbarium from all sources to date increase the grand total of the herbarium to 149,141, of which about 87,500 are Philippine and 61,655 are extra-Philippine. It is estimated that nearly 3,000 additional specimens, Philippine and extra-Philippine, are on hand, but these have not been entered as the specimens are not yet arranged, numbered, or otherwise prepared for identification. Work on this material is being pushed as rapidly as possible.

In our coöperative work with the Bureau of Forestry the latter has arranged to install a small herbarium case at each forest station, and we have agreed not only to report the collections by number, giving the Filipino and scientific names and the family to which each species belongs as heretofore, but also to mount and return a duplicate of all botanical material sent in by the foresters, which will be sent to the forest station nearest to the place where the material was collected. Already 633 specimens have been mounted and returned. It is believed that this will add greatly to the value of the work done by the rangers and foresters, will stimulate interest on their part in the matter of collecting botanical specimens, and will tend to reduce the duplication of species as foresters and rangers change stations. As in the past, the original set of all material submitted by employees of the Bureau of Forestry is mounted and incorporated in the herbarium of the Bureau of Science.

The type collection.—Since it was improbable that fireproof quarters for our valuable herbarium could be procured soon, the entire type and cotype collection of 3,500 sheets was placed in special cases in the fireproof east wing of the Bureau of Science building, where it is arranged in families and genera. Each case is one half the size of a standard herbarium case. This size was selected so that the cases, with contents intact, could be removed from the building in case of emergency. Types and cotypes of cellular cryptogams have not been segregated.

The fact that types are stored in a part of the building far removed from the general herbarium has materially added to the difficulties in making current identifications, and much time is lost in going from the general collection to the type collection. This, however, cannot be safely remedied until proper fireproof quarters are supplied for the entire collection.

Publications.—A list of papers which have been published in Section C, Botany, of the Philippine Journal of Science is given elsewhere. A paper entitled "Philippine dipterocarp forests," by W. H. Brown and D. M. Mathews, prepared during the year, was published in, and fills the last two numbers of, Section A, Chemical and Geological Sciences and the Industries, of the Philippine Journal of Science. This paper is a very extensive and most important physiological and ecological study on the distribution, composition, effect of cutting and clearing, and management of the chief dipterocarp forests of the Philippines. Mr. Merrill has prepared an extensive paper entitled "A contribution to the bibliography of the botany of Borneo," containing over 500 titles, which has been submitted to Mr. J. C. Moulton, Sarawak, for publication in the Sarawak Museum Journal. Other papers by Mr. Merrill and Doctor Brown are in press, and still others are ready for the printer and in preparation.

Uncompleted work.—There are three especially extensive collections of extra-Philippine botanical material from Borneo, from China, and from Amboina, which have not been worked up, although considerable work has been done on the Borneo collection. Our most important project on extra-Philippine material is the one from Amboina, which was interrupted by the sad death of Doctor Robinson. His collections are now at the Bureau of Science. The collection as it stands is one of the most important that has been made in the Malay Archipelago—important, not so much from the fact that new species are to be expected, but because the bulk of the species represented will be of great value in interpreting the species of the older authors that by reference are based on the figures in Rumphius's Herbarium Amboinense and not on actual specimens. The material has been arranged in two series: First, those specimens that could be definitely referred to plants described or figured by Rumphius in his Herbarium Amboinense; and secondly, those that are apparently not described by Rumphius. The first series has been distributed into sets under the title "Plantae Rumphianae Amboinenses," the Rumphian name and reference being added to each label. It is planned, before distributing the material, to add the modern botanical name in each case. The second series of specimens has been distributed into sets under the title "Reliquiae Robinsonianae."

Mr. Merrill's attempt to interpret the species described by the Spanish botanists Blanco and Llanos, of which no types are extant, is being continued. These species have been obscure to all botanists since they were described, because the authors preserved no botanical material. These species can be properly interpreted only by a careful study of the original descriptions in connection with all other data given by the authors—economic notes, native names, habitats, dates of flowering, etc.—comparing such data with our extensive collections of Philippine material, and searching for individual species in the exact localities mentioned by the authors.

Doctor Brown's investigations on the relation of environmental factors to the physical type of vegetation on Mount Maquiling are nearly completed. All of the chief types of Philippine vegetation are represented on this mountain. A thorough series of measurements, extending over two years, has been made on all types of vegetation and the occurrence of the different physical types thereby explained. His completed paper promises to be of great importance, for no similar work, at least on such an extensive scale, has ever been done in the tropics.

Field work.—Aside from the work on Mount Maquiling, exploration and collection trips were made to Samar, Laguna, Cavite, Rizal, Bulacan, Pangasinan, and Batangas Provinces. Mr. R. C. McGregor made an extensive and valuable collection in Biliran, an island previously quite unknown botanically. Mr. Merrill did field work in the vicinity of Baguio for about six weeks, and made a number of short trips in the vicinity of Manila. Rich collections from Leyte and Bontoc have been presented to the Bureau by Mr. C. A. Wenzel and by Father M. Vanoverbergh, respectively.

SECTION OF ICHTHYOLOGY OF THE BIOLOGICAL LABORATORY

Expert advice has been given regarding methods of fishing, the formulating of pearling and fishing laws, as well as information regarding the location of fishing banks and pearling beds, and instructions regarding the construction of fish ponds. The economic fisheries industries of the Islands, such as the production of window shells and other commercial shells, fish culture, the curing of trepang and other fishery products, and the establishment of sardine canneries, have been stimulated in many ways. The causes of poisoning from eating certain fishes have been investigated. The fish expert has finished several inspection and collecting trips and has occasionally been detailed to solve definite problems. He has worked out a method of conserving the pearl fisheries and of increasing the revenue therefrom for the Department of Mindanao and Sulu.

Fish culture.—In 1913 a spawning pond for the mosquito fish, *Gambusia affinis,* was finished near the Bureau of Science. Notices have been published from time to time that mosquito fishes would be supplied free to any one who would apply. A large number have been distributed in the vicinity of Manila, and we have an ample stock ready for distribution.

The black bass, *Mycropterus salmoides,* brought originally from the United States in 1907, have increased in a most satisfactory manner, the two lakes and Trinidad River at Baguio being now well stocked. A shipment of black bass was established in Lake Lanao, Mindanao, on December 22, 1913. The spawning pond for black bass built near the Bureau of Science was inundated by the flood in September, but due to our prompt action in constructing a high fence around it only a few of the bass escaped. The pond is now stocked with between three and four dozen fine bass, which will probably spawn in a few weeks.

Investigation.—A very good collection of fishes from Mindoro has been identified, and several new species have been discovered. Several manuscripts relating to fish products in the tropics and describing new species of fishes have been prepared and published.

SECTION OF ORNITHOLOGY AND TAXIDERMY OF THE BIOLOGICAL LABORATORY

When the Bureau of Science was established little was known of Philippine birds. Considerable work has been carried on in order to determine the Philippine species. The classification of Philippine birds is a primary requisite to economic work on the subject. At the present time our effort is to furnish information with regard to the habits and distribution of beneficial and injurious birds and of game birds. A mounted collection of common forest birds has been prepared for the use of forestry students so that they may learn the birds of the forests and whether they are injurious or beneficial. This work has necessitated several details of the assistant collector to Los Baños. The chief and the assistant collector made a field trip to Biliran Island, Leyte Province, which occupied the period May 16 to July 8, 1914. A trip was made to Dagupan to collect water birds. On several short trips which have been taken some work in collecting birds' stomach contents was done.

The study of the food habits of birds is a problem almost untouched in the Philippine Islands, and yet extensive work of this kind would lead to very important results. The determination of whether birds are injurious or beneficial is of the greatest importance to agriculture and forestry. Insectivorous birds hold in check insects which destroy leaf and twig. The results of the work which we have been able to do were issued on September 28, 1914, as a press bulletin, which was distributed for publication, entitled "Birds in their economic relation to man through agriculture and forestry." The work will be continued. This work is so important to the United States that it occupies much of the time of the Bureau of Biological Survey and a considerable portion of the time of the Department of Agriculture.

Several cases of mounted specimens have been added to the exhibit. A series of rats to be sent to the United States National Museum for identification has been prepared; deer heads, birds, and other animals have been mounted; collections of birds, sent to this Bureau for that purpose, have been identified.

One short paper has been published in the Philippine Journal of Science, and as heretofore, Mr. McGregor has continued to devote considerable time to the Bureau publications.

In so far as possible information has been furnished to the committee appointed on February 14, 1914, by His Excellency, the Governor-General, with regard to the breeding and other habits of Philippine birds and mammals in order that they might provide protection to animal life in these Islands. This information should be greatly extended.

SECTION OF ENTOMOLOGY OF THE BIOLOGICAL LABORATORY

Personnel.—On December 31, 1913, Mr. Willie Schultze, for ten years assistant entomologist of the Bureau of Science, severed his connection with the laboratory to accept a position in commercial life. He was a faithful employee, and through his zeal and energy our collections of Coleoptera and Lepidoptera were built up and arranged. He has completed a catalogue of Philippine Coleoptera which is ready for publication.

For five years Mr. C. S. Banks has been teaching entomology in the University of the Philippines. In July, 1914, the Honorable, the Secretary of the Interior decided to abolish the teaching function of the section of entomology, and on August 1, 1914, Mr. Banks was transferred to the University of the Philippines, in which capacity he continues the supervision of the mosquito extermination project which was originally organized at the instigation of this Bureau. A Filipino employee, to whom can be entrusted the work of preparing and mounting insects for the cabinets, was added to the staff in 1913.

Routine work.—The work of this section has been to assist the Bureaus of Agriculture, Health, Forestry, and others in suggesting methods of exterminating such common pests as sugar cane insects, locusts, mosquitoes, flies, and forest insects; in classifying injurious and other insects; and in working out life histories and devising means of keeping insect pests in check. Considerable time has been consumed in furnishing information with reference to injurious insects and insecticides, and formulas for the preparation of the latter have been suggested when such were necessary. At present this work is largely suspended owing to lack of personnel.

Accessions.—During the last year and a half nearly 2,000 numbers have been added to the collection, which represent several times that number of insects. The extension of the collections is being continued through our trained assistants and by gifts.

Identification of material.—A number of entomologists have served in the identification of material and in the preparation of papers for publication, of which several have been published and a few are now on hand.

Silk.—The silk industry was introduced into the Philippine Islands by the Bureau of Science. Silkworms have now been grown for eight years and have never suffered from any disease. Our work in the culture of silk is being continued, and we are now raising our stock of about 10,000 silkworms each generation. There have been a large number of inquiries with reference to the industry and requests for silkworm eggs; and the desirability of extending the silk industry throughout the Philippine Islands becomes more apparent each year. There are very few people who have mulberry trees ready to feed the silkworms, and fewer still who have the requisite training to care for the worms, so that progress is slow. However, through the efforts of the Bureau of Science silk culture is steadily increasing in the Islands. It was introduced into one new province during August.

There is a large amount of work that ought to be done to ascertain the best races of silkworms that should be introduced and crossed with our own in order to retain our own worms in vigor and free from danger of disease. The need of a technically trained individual to have actual charge of silk culture and its propaganda in the Philippines becomes more apparent as time goes on.

CHEMICAL LABORATORY

During the last school year Dr. Harry D. Gibbs, chief of the division of organic chemistry, and Mr. Albert H. Wells and Mr. F. Agcaoili, assistants in the division, were detailed for part of their time to the department of chemistry of the University of the Philippines, and Dr. A. P. West, an assistant in the division of general, inorganic, and physical chemistry, was detailed to give all of his time to the University. Mr. Albert E. W. King, an assistant in the latter division, has given a course in testing cement to students of the College of Engineering. The assistance has been given to the University at considerable sacrifice and interruption of the continuity of our work, and all with the exception of the course in cement testing had to be discontinued on account of resignations and the depletion of our staff.

Physical research.—Since my last report the work on the relation between the electrical and meteorological conditions of the atmosphere has been continued under the direction of Dr. J. R. Wright, the scope of the work being extended to include several additional correlated factors. Observations on the radium-emanation content of the atmosphere of Manila have been continued with the view of determining both the annual and diurnal variation with meteorological conditions. During April and May of the two preceding years an extensive series of observations has been taken on the top of Mount Pauai, Benguet subprovince, in order to determine the variation of the radium-emanation content with altitude. Simultaneously with the above investigation, observations have been taken on the amount of radium and thorium emanation in the atmosphere by the active-deposit method, the chief object of which is to determine the diurnal variation and its relation to the humidity, barometric pressure, and other meteorological factors. Work has also been started on the following problems: (1) Determination of the ionization of the atmosphere by Ebert's method, (2) determination of the rate of production of ions in a closed vessel due to the penetrating radiation from the radioactive substances in the atmosphere and the earth's crust, (3) determination of the diurnal variation of the potential gradient at the surface of the earth, and (4) the absolute value of the intensity of the rays from the sun.

All of the above problems are being studied in connection with the observations, taken daily at the Manila Observatory, of the intensity of the sunlight, humidity of the atmosphere, amount of rainfall, and the direction and velocity of air currents.

Apparatus.—Since my last published report we have received considerable new apparatus, the need of which has long been apparent. Among these are a 30,000-pound Olsen testing machine; a clay-pugging and brick-making machine from Chambers Bros. Co.; a Seger furnace; a rotary crusher; jaw crusher; roller cursher; and sieving machine for grinding and preparing ceramic, cement, road and concrete materials, and ores; and a 19-horsepower liquid-air machine purchased jointly by the Bureau of Science and the University of the Philippines, consisting of a 200-atmosphere, 3-step, vertical model compressor with a suction capacity of 54 cubic meters per minute, and an Olszevski apparatus for the liquefaction of air having a capacity of 3 liters per hour. These machines will greatly facilitate the work of this department, but it is desirable that a suitable permanent place be provided in which to protect them.

DIVISION OF GENERAL, INORGANIC, AND PHYSICAL CHEMISTRY

Personnel.—Mr. W. C. Reibling, chief of the division, went on leave in April and resigned September 15, 1914, to accept the position of superintendent of the American Tar Products Co., St. Louis, Mo., and Dr. A. P. West was transferred to the University on March 18, 1914. Mr. George W. Heise, physical chemist, arrived from the United States and began duty on July 24, 1913. Mr. Rutherford B. Martin resigned on November 19, 1913. Mr. Francisco D. Reyes and Mr. Emilio Natividad severed their connection with the Bureau on April 16 and October 31, 1914, respectively. Mr. Francisco Peña was appointed December 1, 1913. Mr. R. R. Williams was appointed on September 16, 1914, to fill the position of chief of the division. The research work of Mr. Williams has been largely in the field of biological chemistry. The losses suffered by resignation have not been made good, and the present staff is inadequate properly to carry on the work which should be done.

ROUTINE WORK

The routine work continues to be of the same general character as that described in the report for the fiscal year 1913. A classified summary of the routine work done by this division by periods since 1909 is included, as follows:

Nature of material.	1909-10	1910-11	1911-12	1912-13	July 1 to Dec. 31, 1913.	Calendar year 1914.
Rocks and minerals		25	46	12	3	
Soils, fertilizers, cements, and clays	3,342	3,738	8,636	9,617	5,137	6,884
Metals and alloys	24	46	36	45	14	51
Road materials, stone, gravel, sand, and concrete		400	248	130	136	132
Waters	82	164	146	197	126	208
Calorimeter determinations of fuels		29	9	31	7	7
Boiler tests of coal		10	2			
Standardizations of weights and measures (sets, except assorted)		1,066	990	1,127	[a]1,321	1,300
Coal analyses		154	20	58	3	22
Miscellaneous[b]	248		248	91	60	88
Paints				46	33	41
Total	3,696	5,672	10,381	11,354	[c]6,840	8,733

[a] Units.

[b] Work classified under Miscellaneous in 1910 is largely segregated in the following periods.

[c] Six months only.

This shows a reduction in the number of analyses of waters performed in the laboratory due to the inauguration of field examinations and in the number of cements on account of the limited funds available to the Government for public works.

The routine work of this one division was done at the request of individuals representing private or corporate interests and of officials in the following various departments of the Government: Bureaus of Agriculture, Constabulary, Customs, Education, Forestry, Health, Quarantine Service, Lands, Prisons, Public Works, Supply, and Science; the city of Manila; Provinces; municipalities; and the United States Army and Navy. It will be seen how generally the Bureau of Science is utilized. As indicated under the heading Committee on Standardization of Supplies, the conditions in the Philippines make it essential to do more or less research work in connection with almost every request. Results obtained prove conclusively the great need of standard requirements for all classes of material and the advisability of improving local products. For many of the materials such as crayon, blackboards, roofing, sensitized and cigarette paper, automobile tires, and tool steel sent to us for standardization no specifications were available. However, we devised tests, which in most instances were sufficiently effective to show the real or relative value and usefulness of the materials.

RESEARCH WORK

Specific investigations in various stages of completion are as follows:

Paints.—The systematic study of the efficiency and value of different commercial pure and mixed paints to determine their actual value under local conditions is being carried on.

Field water survey.—A paper on water supplies in the Philippine Islands, by Alvin J. Cox, George W. Heise, and V. Q. Gana, has been completed and published. Field water survey work has been begun within the last three months and so far has been carried into Cebu and Iloilo Provinces. Its chief objects are to give immediate information to officials in charge of public works and sanitation and construction and to establish chemical standards for judging Philippine waters. It is possible to get the greatest accuracy only in the laboratory, but the rapidity and many other important factors more than compensate for the disadvantages of working in the field. Already this work has saved to the inhabitants of these Islands many times the cost of the undertaking.

Galvanized iron and tin plate.—Work was undertaken to show the chief causes of the diminished durability in a tropical climate of galvanized iron available on the market at present as compared with that of two or three decades ago. In connection with this work the excessive rusting of tin containers, which has entailed severe loss upon several local manufacturers, was studied. The problems involved were those of corrosion and protective coatings in general. Tin coating sufficient to give satisfactory results under normal condition of service is too thin and too poorly applied to prevent excessive corrosion under the slightly severe conditions of a tropical climate.

Iron smelting.—A study has been made of the modifications of Filipino smelting processes, which can be put into effect by small producers for an improvement in yield and quantity of iron and economy of production.

Lime burning.—Operations have been carried on to secure a small kiln that will be economical of fuel and serviceable to the small producer.

Cement.—Attempts have been made to produce a cheap pozzolana cement from volcanic tuff and lime which can be substituted for Portland cement in certain classes of construction. Papers on Burning tests of Philippine Portland cement raw materials, by Augustus P. West and Alvin J. Cox; The efficiency of Portland cement raw materials from Naga, Cebu, by W. C. Reibling and F. D. Reyes; and Natural cement versus brick; Iwahig Penal Colony raw materials, by W. C. Reibling, have been published.

Soils.—A paper on The soils of the Island of Luzon, by Alvin J. Cox and A. S. Argüelles, has been finished and published, and

Mr. Argüelles is now coöperating with Doctor Brown on a study of soils and soil moisture in relation to tropical vegetation.

Gas-producer operation.—A careful study of the chemical composition of producer gas has been made to develop the most economical generation.

Salt industry.—The study of the salt industry resources of the Philippine Islands has been continued, and means have been suggested for improving and increasing the output.

Brick making.—Clay and shales suitable for use in the manufacture of clay products, such as building and paving bricks, tiles, and common pottery, are abundant in the Philippine Islands. The Bureau of Science has demonstrated the suitability of these by manufacturing the products in the laboratory.

Leather industry.—Our chemists have shown that by simple, inexpensive modifications of their methods the local tanners can vastly improve their product in weight, finish, and durability, and particularly as to odor. This work has been carried on in Meycauayan. Already Filipino tanners have been very much interested, and the work should lead to important and practical results.

Many smaller problems have been touched upon, more or less superficially.

DIVISION OF ORGANIC CHEMISTRY

Personnel.—Dr. Harvey C. Brill and Mr. William B. O'Brien, new appointees, arrived from the United States and began service on July 24, 1913. Dr. Harry D. Gibbs, chief of the division and assistant to the Director, resigned on June 15, 1914, to accept a position with the United States Department of Agriculture, Washington, D. C., and Mr. O'Brien was transferred to the University of the Philippines on August 9, 1914. Dr. David S. Pratt, a member of the division, who was in charge of the division while Doctor Gibbs was on leave in the United States, from which he returned on September 9, 1913, was promoted on September 16, 1914, to the position of chief of the division to take effect upon his return to duty. Mr. Robert R. Williams was transferred to the division of general, inorganic, and physical chemistry as chief on September 16, 1914. No new appointments have been made, and the division is left in a depleted condition.

ROUTINE WORK

The routine work of this division consists of the inspection, analysis, and examination of foods, drinks, drugs, and other organic substances. The routine work performed is shown in the following table:

Nature of sample.	Calendar year 1914.					Total for six months ended Dec. 31, 1913.
	Examined under Act No. 1655.	Adulterated or misbranded.	Government work (not included under Act No. 1655).	Private work.	Total.	
Dairy products	25	4	38	3	66	156
Meat products	19	8			19	23
Nonalcoholic drinks	9	1	32	5	46	45
Alcoholic drinks	3	1	10	3	16	33
Vegetables	23	7	8	4	35	14
Cereals			53	4	57	71
Fruit products	7	5		4	11	12
Essences and essential oils	16	14		17	33	18
Condiments	1	1	10		11	1
Oils			18	5	23	16
Drugs and medicines	[a]11	7	10	1	33	36
Clinical examinations			247	69	316	115
Opium and legal cases			44		44	12
Paper and textiles			108	1	109	96
Raw sugar			19	211	230	25
Sugar cane			21	57	78	12
Sugar food				2	2	
Copra			43	4	47	
Human milk			38	4	42	28
Commercial and miscellaneous			40	36	76	53
Total	114	48	739	430	1,294	566

[a] Examined under Act No. 2342, 11 samples; adulterated or misbranded, 4.

The clinical examinations and the analyses of sugar and sugar cane samples for the calendar year 1914 have increased over those of the fiscal year 1913, while the number of samples of foods examined is less. As most of the samples of food come from the Bureau of Customs, the decrease is readily explained by the shrinkage in imports on account of the European war and the fact that manufacturers have become better acquainted with the pure food laws and consequently violate their provisions less frequently.

The number of foods adulterated was 41.6 per cent in comparison with 19.5 per cent for 1912 and 27 per cent for 1913. The percentage found adulterated is higher than is the case in either of the other years cited. However, this is at least partly due to the fact that the officials of the Bureau of Customs exercise greater discretion in the choice of samples submitted.

The falling off of dairy products examined is due to the decrease in imports and to the fact that the special investigation of milks carried on by this laboratory, for the purpose of preparing standards for infant feeding, has been completed and the information made available.

The Food and Drugs Regulation Act No. 2342 has increased the correspondence and the number of consultations with importers and manufacturing druggists, and this work will be still greater when the imports of the Islands resume their normal condition. As the Bureau of Science member of the food and drug committee is the only one of that committee who has any technical knowledge of chemicals, the greater share of such work falls upon him. No statistical report of this work can be made, but it very often necessitates criticism of a large number of labels and the examination of a great deal of advertising matter to determine whether or not it is in violation of the law.

RESEARCH AND INVESTIGATION

With Dr. D. S. Pratt on leave, this division has but three men, and of necessity a large share of their time must be devoted to routine work. However, some research work has been done. Investigations under way, or practically completed, include: The examination of calumpang, the Catanduanes nut, and further work on the lumbang banucalag with drying tests of the oils; methods of rectifying ylang-ylang oil and some new discoveries regarding the same; the destructive distillation of Philippine woods with temperature control and a study of their products; a study of tiqui-tiqui and its relation to beriberi; a continuation of the effect of storage on various Philippine distilled wines and alcoholic distilled beverages; the extraction of the perfume of the flowers of the gardenia and of the camia; the curative chemical properties of a number of oils which have been confused with true chaulmoogra oil, and an attempt to isolate a principle which will cure leprosy; the fermentation and manufacture of cacao from the dried bean; and the nipa palm as a commercial source of sugar.

A scientific investigation of several industries in India and Ceylon, which are the most advanced countries in the world from the standpoint of tropical agriculture, has been carried on in order to introduce into the Philippines, under the most favorable conditions, several industries, one of which is the papaya gum, or papain, industry. Papain possesses several properties superior to pepsin, which it is gradually replacing and which will increase the demand for the gum. Parke, Davis & Company state: "We employ approximately 2,500 to 3,000 pounds of papaya gum per year and obtain it at from $1.90 to $2.20 per pound. At present there is a great scarcity of good gum." Another firm writes: "We are willing to pay $3 per pound for really good juice and will take all that we can get at that price." There seems to be no reason why the Philippines should not supply the world's market with good, clean, active gum produced under careful supervision and by scientific methods.

The report of the Iloilo sugar laboratory is made separately on page 57.

DIVISION OF MINES

Personnel.—The staff of this division was seriously depleted during the year 1913 after it was definitely determined that a reduction in the staff for the ensuing year would be necessary. Where formerly we had five civil service men and one temporary geologist in this division, we now have only three authorized positions for geologists. At present the chief of the division and one other geologist are on duty. Mr. F. A. Dalburg went on leave in May, 1913, and subsequently resigned, effective November 14, 1913, and Mr. Paul R. Fanning went on leave on June 14, 1913, and did not return owing to the fact that his position was not provided for by the appropriation bill. Mr. Percy D. Kincaid, a temporary employee, resigned and left the service on April 30, 1913. Dr. Warren D. Smith, formerly chief of the division, resigned on June 16, 1914. Mr. Wallace E. Pratt was appointed chief of the division, effective June 16, 1914, and the work of the division, except the drafting and some of the assaying, was performed by him alone until Mr. Victor E. Lednicky, a new appointee, arrived from the United States and began service on October 22. Mr. A. E. W. King, of the division of general, inorganic, and physical chemistry, was assigned to assist with the assaying. By strenuous efforts Mr. Pratt and his assistants have completed a large amount of standard work, but it is essential that the staff of this division be maintained at not less than the full quota of three well-trained and well-paid scientific men if the work which the division does is to continue. Mr. I. J. Davis, a civil engineer in the employ of the Federal Government, was appointed an assistant of this division in March, 1914, without remuneration, and has devoted his spare time to work in the laboratory. Mr. R. A. Rowley, professor of geology in the University of the Philippines, has been continuing his petrographic study of Palawan rocks—begun when he was a partial employee of the Bureau of Science—and has spent considerable time working in the division on this and other petrographic work.

ROUTINE WORK

During the last year and a half the regular assays for private parties and for prospectors in new districts as well as cyanidization of ores have been continued. One hundred sixty-seven assays, 34 bullion smeltings, and 209 placer gold weighings have been performed during the past year. The ore-dressing machinery already mentioned under the heading Chemical Laboratory is set up and available for use in the reduction of ores and rocks. Considerable time has been required in the preparation of an exhibit for the 1914 Philippine Exposition as well as in segregating a representative collection of mineral and other specimens suitable for the Panama-Pacific International Exposition in 1915.

Consultations with mining prospectors and operators, determinations of mineral specimens, and examinations of various classes of rocks have required a great deal of the time of the staff. The usual drafting necessary in the preparation of maps and drawings for publication in the Philippine Journal of Science has been carried on and in addition a number of placards and labels for the Bureau of Science exhibit at San Francisco have been made.

As heretofore there has been a demand for the services of the geologists in the development of local mineral resources on account of the inability to secure private engineers. It has been impossible to fill this demand entirely or to do as much field work as usual. The following work has been carried on: A general reconnaissance of northern Luzon and a geological reconnaissance of Caramoan Peninsula, Camarines Province; a private professional examination of the iron-ore deposit of the town of Mambulao, Camarines; a study of the landslide which threatens the safety of the Baguio Hospital; an inspection of the various mining properties near the town of Baguio; a private professional examination of certain limestone deposits in Laguna Province.

The relations of our scientists with the men interested in the mining industry have continued to be cordial. The reference list of Philippine mining corporations which was started some time ago has been extended and nearly completed. All of the data in our possession concerning the history, progress, and present status of every mining corporation, together with such information as we have concerning the geology of their mining claims, have been brought together and are readily available. There has been an increasingly large number of inquiries from the general public with regard to the mining industry. The demand for advice on many matters of mining and mining laws and general mining subjects has also greatly increased, and there is greater knowledge and appreciation of the services which our specialists can render. We have received a greatly increased number of calls and inquiries from Filipinos, which indicates a growing interest on their part in the mineral resources of the country. Filipinos are especially interested in the iron-ore resources.

Mining legislation.—The past year has been marked by much interest in legislation concerning mining, and we have supplied a number of recommendations on various subjects relative to the mining industry; for example, that of requiring all stock-mining corporations to publish in their prospectuses a report by the division of mines of the Bureau of Science on the property which it proposes to exploit; on mine taxation; on special legislation to establish a school of mines; and other facts. The division of mines of this Bureau is in a position to know and to learn about the defects of, and needed changes in, the mining law more than any other department of the Government, and the opinion of our specialists should be considered in all matters pertaining to mining legislation. A study of the defects of our mining laws should be continued until some positive action along the lines recommended by this Bureau is taken.

INVESTIGATIONS AND PUBLICATIONS

The papers which the scientists of this division have contributed to the Philippine Journal of Science are included in the list given on page 39 and include titles which mark the completion of several large pieces of work upon which employees have been engaged for several years. The completion of the paper on Tayabas petroleum by Mr. Pratt and Doctor Smith should stimulate the development of that district. Work on the Angat, Bulacan, iron ores, including a microscopical study, and notes on the geology and underground water resources of Panay have been completed. There is considerable work in progress, including the examinations of cuttings from the deep wells drilled by the Bureau of Public Works. Preparations are now being made for a geologic exploration of the reported extensive iron-ore deposits in Surigao Province.

The Mineral Resources of the Philippine Islands for 1913 has been printed and is being distributed. It contains the following articles:

Review of the year, by Warren D. Smith.
Statistics of production.

THE METALS

The Paracale District, by F. T. Eddingfield.
The Aroroy District, Masbate, by Warren D. Smith.
Other mineral districts (including Baguio), by F. T. Eddingfield.
The Bulacan iron-ore resources, by Wallace E. Pratt.

THE NONMETALS

Coal mining in 1913, by Wallace E. Pratt.
Philippine production of nonmetals in 1913, by Wallace E. Pratt.

SPECIAL ARTICLES

Gold dredging in the Philippines, by William Kane.
Mine exploitation and the causes of some mine failures in the Philippines, by F. T. Eddingfield.
A preliminary check list of Philippine minerals, by Warren D. Smith, F. T. Eddingfield, and Paul R. Fanning.

In spite of the generally unsatisfactory economic conditions, Philippine mining has made much progress during the current year.

PHILIPPINE MUSEUM

The work of the division of ethnology has been reduced practically to that in connection with the Philippine museum as shown by the administrative order of the Secretary of the Interior of July 11, 1914 which states, "* * * The ethnological museum will be retained as an exhibit, but it will not be extended by further research * * *." Only those positions necessary for maintaining the museum were retained and appropriated for by the legislature. The resignations of Mr. Leslie F. Taylor and Mr. John M. Garvan were received, effective January 31, 1914, and September 21, 1914, respectively, and Mr. H. O. Beyer was transferred to the University of the Philippines on November 13, 1914,, effective after the collection of specimens for the Panama-Pacific International Exposition has been completed.

The splendid collections of Philippine hats, basketry, tools, weapons, agricultural implements, brass work, clothes and cloths, illustrating the life of the peoples of the Islands were kept open to the public from 7.30 a. m. to 5.00 p. m. on Monday to Friday and from 7.30 a. m. to 1.00 p m. on Saturday until November when the best of the exhibit was sent to San Francisco as a part of the Bureau of Science display at the Panama-Pacific International Exposition. (See page 51.)

The study of the Ilocano people, begun four years ago, has been completed, and the report would have been in my hands before this except for the interruption of Mr. Christie's work to make a collection illustrating the life of the Visayan people with special reference to the Panama-Pacific International Exposition. Similar Tagalog, Pampanga, and Pangasinan collections have been made.

LIBRARY

Personnel.—Miss Emma E. Kinne, assistant librarian, went to the United States on leave on June 3, 1914, and resigned, effective September 14, 1914. There have been no other changes in the responsible personnel of the library. The organization and routine of the library has been continued as outlined in my Twelfth Annual Report. The apprentice system, inaugurated three years ago, has been very successful, not only in that the amount of money spent for carefully selected apprentices results in more intelligent service, but also a group of young people with an elementary knowledge of library science will become available for library work in other libraries in Manila and throughout the provinces and will interest themselves in the library extension and other public welfare work if we retain sufficient trained librarians to teach them. The record of the accomplishment of the library is as follows:

	July 1 to Dec. 31, 1913.			Calendar year 1914.		
	Volumes.	Parts.	Cards.	Volumes.	Parts.	Cards.
Cataloguing	2,984	1,182	2,139	4,032	1,256	3,299
Reclassification and subject work	359	89	671	16	17	28
Total	3,343	1,271	2,810	4,048	1,273	3,327
Printed cards			783			12,847
Total cards filed in official catalogue			3,593			16,174

The accessions from July 1 to December 31, 1913, and for the calendar year 1914 were 1,554 and 2,654 volumes, respectively, making a total number of 30,860 bound volumes in the library on December 31, 1914. A number of old and rare single publications and several sets of great value were received prior to December 31, 1913. Our orders for the calendar year 1914 have been restricted almost wholly to the continuation of serials already in the library. Publications of the value of ₱8,785.53 have been delivered during the calendar year, leaving outstanding orders to the amount of ₱4,336.65.

The period during which the library was open was reduced, on account of the small library staff, from eighty hours per week to sixty-two hours by changing the closing hours from 9.00 p. m. to 6.00 p. m. on five days per week and the opening hour from 7.30 a. m. to 8.00 a. m. on six days. The use of books has decreased somewhat with the reduction in the library hours. From July 1 to December 31, 1913, and for the calendar year 1914, 12,021 and 22,830 publications, respectively, were issued—a monthly average of 1,936 and a daily average of 63.7.

Binding.—Seven hundred volumes were sent to the bindery and 941 volumes were returned from July 1 to December 31, 1913. Six hundred eight volumes remained at the bindery on December 31, 1913. Two hundred have been sent since that date. The entire 808 had been returned in July, and none have been sent since. Owing to the lack of funds, the binding is getting very much behind.

Classification and cataloguing.—All new material has been, and is being, classified and catalogued as received, and some progress has been made on the unclassified collection. The classification of college catalogues has been completed, and all new catalogues are added as received. Work on the trade catalogues has progressed, and many duplicates and obsolete publications have been discarded. This material is now in fairly workable shape. Work on the revision and classification of maps, charts, and blue prints has been begun, and the convenient arrangement of the maps in the specially provided cases will soon be completed. A large amount of miscellaneous work cannot be mentioned on account of lack of space.

Printed cards.—Comparison of the cost of printed and typewritten cards indicates that the cost of the latter is more than three times as much as that of the former. As soon as they can be handled, an effort will be made to secure printed cards, covering publications in the library, from as many available sources are possible.

Cuts.—Cuts from the Bureau of Science publications were numbered and arranged on shelves, and proofs of nearly 4,000 of them were pasted in an album. The proofs bear numbers corresponding with those on the cuts, and the second set is numbered in a reference set of the publications on the library shelves. An index to be made will give immediate access to any given cut or proof.

Reserve stock of the Philippine Journal of Science.—Collation of 75 reserve sets of the Philippine Journal of Science has been completed. Additions to this stock are now examined before reaching the library, so we can be reasonably certain that volumes of this publication sold or sent in exchange are complete.

Exchanges.—On account of the necessity for the strictest economy, little effort has been made to increase the exchange list of the Philippine Journal of Science. Valuable gifts and exchanges sent in return for the Annual Report of the Director of the Bureau and for Mineral Resources have added important publications to the library.

Library training.—During the college year 1913–14, two or three recitation periods were given to the five-year students in the College of Medicine and Surgery of the University of the Philippines to familiarize them with the Index Medicus. This work has been extended during 1914–15 to include from 8 to 10 recitation periods and, in addition, elementary work has been given in the use of the library shelf list, dictionary catalogue, and union catalogue, and in the use of reference books. Twenty-three students, each receiving one lesson per week, are enrolled in this course. The librarian of the Bureau of Science also coöperates in a course in library training offered by the College of Liberal Arts of the University of the Philippines.

ENGINEERING DIVISION

Since September 10, 1908, the engineering division has been entirely Filipinized. There have been no important changes in the direct supervision of the power plant during the period covered by this report. Mr. José Guerrero y Reyes remains as chief power engineer and Mr. Felix V. Valencia was appointed an assistant engineer on April 1, 1914, to relieve Mr. F. R. Ycasiano, who has drawn the plans and supervised the reconstruction of the Bureau of Science boiler units and is taking up the more important work of the mechanical and testing engineering which has been planned for several years.

Power plant.—The function of the central power plant for the Philippine General Hospital, the Bureau of Science, and the College of Medicine and Surgery, which is under the direction of this Bureau, was fully described on page 91 of my Twelfth Annual Report. The addition of a Dutch-oven furnace to the new boiler installed in 1913 has been a great success, and with this system we have obtained a saving of 2.82 per cent in the consumption of fuel. Under ordinary load it produces practically no smoke. There is no known method of eliminating smoke from a boiler when it is worked under an overload. The new boiler works so satisfactorily that there has been a restoration of funds with which to install two Dutch ovens in front of the two old boiler units. Plans have been drawn for the reconstruction of these ovens. The necessary arch bricks for making the Dutch ovens arrived from the United States, the ordinary fire bricks from Hongkong, and the work of raising the boilers 45.5 centimeters and reinstalling them has been completed during the year. Under ordinary load these two boilers produce practically no smoke. The elimination of smoke has always been a serious problem when bituminous coals are used, but we believe that the arrangement now in use in the Bureau of Science will be satisfactory and should be extended throughout the city as much as possible.

Producer-gas plant.—The producer-gas generator and the gas engine work satisfactorily. We have successfully used Batan coal in the 67-horsepower producer-gas unit for a year and a half, and the experiment has been vastly more successful than I anticipated. The consumption of coal in the producer-gas generator to generate gas used in the gas engine to operate a direct-coupled dynamo varies from 1.6 to 1.7 kilograms per kilowatt hour of electric current produced, whereas we used more than 4 kilograms of Japanese or Australian coal in our steam unit to generate a kilowatt hour of electric current. We have used other classes of noncoking coal satisfactorily in the producer-gas unit. Experiments were carried on to ascertain whether or not the producer-gas plant was capable of continuous operation. The manipulation of the generator has been so perfected that it has to be cleaned one third as often as formerly; in fact, at present it scarcely needs special cleaning at all. For eight months the producer-gas plant has been operated continuously, day and night, except when it was stopped for cleaning and repairs. A water spray in the vertical gas pipe from the gas generator and also another in the horizontal pipe connecting the vertical pipe with the scrubber cleans the gas more perfectly and prevents the incrustation of tar and dust that previously gave trouble. With proper care and adjustment a producer-gas generator and engine is a very reliable prime mover, and its use in this Bureau will result in great economy in the production of electric current. The advantages of the producer-gas engine over the steam engine will be still greater when we use the exhaust gases for heating water for the Philippine General

Hospital. It is very desirable that a second gas generator be installed in order to furnish a continuous supply of producer gas for the engine. During the night shift, when the producer-gas plant is running, a boiler is kept at high steam-pressure to operate one of the steam engines in case of accident in the gas engine in order to avoid any possible interruption of the light service in the hospital.

Engine room.—We have produced a slightly greater quantity of electric current than heretofore and have reduced the cost per kilowatt hour very materially when the producer-gas unit was operating. The amounts generated and delivered at the switchboard from July 1 to December 31, 1913, and for the calendar year 1914 are 125,881 and 272,742 kilowatt hours, respectively. For the fiscal year 1913 the average unit cost was ₱0.10129 per kilowatt hour. The average cost for the calendar year 1914 is ₱0.0895763. The lowest unit cost is ₱0.069091 per kilowatt hour for the month of July, when the producer-gas plant was operated continuously except for fifty-three hours and the price of coal was comparatively high. The fluctuating monthly cost per kilowatt hour was due to the variable price of coal and the length of time that the gas engine was run—that is, the more the gas engine was run, the less the cost per kilowatt hour. Of the total amount of current generated, 49.8 per cent was consumed in the Philippine General Hospital, 7.2 per cent in the College of Medicine and Surgery, and 43 per cent in the Bureau of Science. The total amount of steam generated in the boilers from July 1 to December 31, 1913, and for the calendar year 1914 is 5,262,185 and 10,518,377 kilograms, respectively.

Boiler room.—The unit cost of generating the last-named quantity of steam at 125 pounds per square inch gauge pressure is ₱0.002813 per kilogram. Of the total weight of steam generated 56.4 per cent was used in the Philippine General Hospital, 13.7 per cent in the Bureau of Science, and the remaining 29.9 per cent was consumed by the steam engines to generate electric power.

Mansfield gas-generating plant.—The total production of gas generated from the retorts from July 1 to December 31, 1913, and for the calendar year 1914, manufactured from kerosene and Cape lubricating oil, amounted to 298,681 cubic feet (8,458 cubic meters) and 645,124 cubic feet (18,270 cubic meters), respectively.

Shop.—The jobs completed in the carpenter and machine shop are as follows:

	July 1 to Dec. 31, 1913.	Calendar year 1914.
Bureau of Science	147	293
Bureau of Health	30	18
University of the Philippines	28	6
Other sources	13	11
Total	218	328

The jobs consist of repairing and nickel-plating surgical instruments, repairing photographic cameras, and constructing and erecting electric apparatus necessary for the various institutions, and do not include the necessary and emergency repairs to the power plant. The apparatus mentioned under Chemical Laboratory has been set up by the shop, and the apparatus damaged by fire in the distillation room has been repaired.

THE PHILIPPINE JOURNAL OF SCIENCE AND OTHER PUBLICATIONS

The Philippine Journal of Science is devoted to the scientific and commercial interests of the tropics. The periodical affords a place for the prompt publication of the results of original investigation by the employees of the Government of the Philippine Islands and of suitable investigations concerning any phase of life in the tropics by specialists in Europe and America. At the outset it was announced that the Journal would appear as often as material was available. During 1914 the Journal was issued in 4 sections, each of which contains 6 numbers; each section is separately paged and indexed. The designations of the sections remained the same as for 1913. In 1913 and 1914 the different sections contained the following:

	Section A.		Section B.		Section C.		Section D.	
	1913	**1914**	**1913**	**1914**	**1913**	**1914**	**1913**	**1914**
Pages	449	568	563	528	525	563	472	553
Plates	54	41	48	15	13	15	56	56
Text figures	38	38	1		7	14	33	45
Maps	4	3	2	1			1	
Charts				7				

The Philippine Journal of Science has published articles on chemistry, geology, mineralogy, bacteriology, protozoölogy, serum therapy, botany, marine zoölogy, anthropology, ornithology, entomology, ichthyology, mammalogy, ethnology, anatomy, surgery, and other allied subjects.

The numbers of the Philippine Journal of Science for the six months ending December 31, 1913, contain the following articles. Names of members of the Bureau of Science staff are marked by asterisks (*).

SECTION A. CHEMICAL AND GEOLOGICAL SCIENCES AND THE INDUSTRIES

* Pratt, David S. (Editorial) Copra spoilage on a large scale.
———. The absorption spectra of various phthalides and related compounds.
———, * Williams, R. R., * Thurlow, L. W., and * Gibbs, H. D. The nipa palm as a commercial source of sugar. A consideration of the principal difficulties encountered in collecting and preserving nipa palm sap.
* Pratt, Wallace E., and * Smith, Warren D. The geology and petroleum resources of the southern part of Bondoc Peninsula, Tayabas Province, P. I.
Saderra Maso, Miguel, and * Smith, Warren D. The relation of seismic disturbances in the Philippines to the geologic structure.
* Smith, Warren D. Contributions to the stratigraphy and fossil invertebrate fauna of the Philippine Islands.
* West, Augustus P. Analysis and composition of red lead.

SECTION B. TROPICAL MEDICINE

Asburn, P. M., Vedder, E. B., and Gentry, E. R. Concerning varioloid in Manila.
——— ——— ———. Some experiments on the inoculation of monkeys with smallpox.
* Barber, Marshall A. A bacteriological examination of certain artesian wells in Rizal, Cavite, and Bulacan Provinces, P. I.
———. An unusual disease prevailing in epidemic form at Buhi, Ambos Camarines, P. I.
———. The infection of Achlya with various microörganisms.
———. The variability of certain strains of dysentery bacilli as studied by the single-cell method.
Boynton, William Hutchins. Duration of the infectiveness of virulent rinderpest blood in the water leech, Hirudo boyntoni Wharton.
DuMez, A. G. The physical and chemical properties of the oleoresin of Aspidium with respect to the detection of adulterations.
Gibson, R. B. Proteoses and fever.
———. The influence of compensated salt mixtures on the development of polyneuritis gallinarum and beriberi.
———. The protective power of normal human milk against polyneuritis gallinarum (beriberi).
Heiser, Victor G., and Villafranca, Rafael. Albinism in the Philippine Islands.

Musgrave, W. E. Infant mortality in the Philippine Islands.

———, and Sison, A. G. Acute malignant glanders in man.

Reyes, C. M. Noma in the Philippine Islands with report of a case ending in recovery.

* Schöbl, Otto. Bacteriological observations made during the outbreak of plague in Manila in 1912.

* Walker, Ernest Linwood. The life history of œsophagostomum apiostomum: I. Development outside of the host.

———. Experimental balantidiasis.

———, with the coöperation of Sellards, Andrew Watson. Experimental entamœbic dysentery.

SECTION C. BOTANY

Ames, Oakes. Notes on Philippine orchids with descriptions of new species, VI.

* Brown, William H. The phenomenon of fatigue in the stigma of Martynia.

Copeland, E. B. Daily growth measurements of Lagerstroemia.

Gamble, J. Sykes. Some additional bamboos of the Philippine Islands.

* Graff, P. W. Additions to the basidiomycetous flora of the Philippines.

Kränzlin, F. Cyrtandraceae novae Philippinenses, II.

* Merrill, E. D. Plantae Wenzelianae.

———. Studies on Philippine Melastomataceae, I.

———. Studies on Philippine Melastomataceae, II.

Radlkofer, L. Enumeration sapindacearum philippinensium novarumque descriptio.

Rehm, H. Ascomycetes philippinenses, II.

———. Ascomycetes philippinenses, III.

Sydow, H. and P. Enumeration of Philippine fungi with notes and descriptions of new species. Part I: Micromycetes.

——— ———. Enumeration of Philippine fungi with notes and descriptions of new species, II.

SECTION D. GENERAL BIOLOGY, ETHNOLOGY, AND ANTHROPOLOGY

Bean, Robert Bennett. Filipino ears: IV. Ilongot and Mangyan.

———. Types among the inland tribes of Luzon and Mindanao.

Bezzi, M. Studies in Philippine Diptera, I.

Crawford, D. L. New genera and species of Psyllidæ from the Philippine Islands.

Gebien, Hans. Die Tenebrioniden der Philippinen.

Light, S. F. Notes on Philippine Alcyonaria. Part I: The Philippine species of the genus Capnella.

———. The morphology of Eudendrium griffini sp. nov.

Mocsáry, A. The Chrysididæ of the Philippine Islands.

Oshima, Masamitsu. Notes on the termites of Japan with description of one new species.

———. Two species of termites from Singapore.

Schenkling, Sigmund. Zwei neue philippinische Cleriden.

Wharton, Lawrence D. A description of some Philippine Thalassemæ with a revision of the genus.

———. Hirudo boyntoni, a new Philippine leech.

The titles of the articles in volume IX, 1914, with their respective authors are as follows:

SECTION A. CHEMICAL AND GEOLOGICAL SCIENCES AND THE INDUSTRIES

No. 1, February, 1914

* Cox, Alvin J., and Argüelles, A. S. The soils of the Island of Luzon.
Wright, J. R., and Smith, O. F. A quantitative determination of the radium emanation in the atmosphere and its variation with altitude and meteorological conditions.
West, August P., and *Cox, Alvin J. Burning tests of Philippine Portland cement raw materials.

No. 2, April, 1914

* Pratt, David S., and *Brill, Harvey, C. The absorption spectra of various phthalides and related compounds, II.
* Reibling, W. C., and * Reyes, F. D. The efficiency of Portland cement raw materials from Naga, Cebu.
* Pratt, Wallace E. Geology and field relations of Portland cement raw materials at Naga, Cebu.
* Reibling, W. C. Natural cement versus brick; Iwahig Penal Colony raw materials.
* Pratt, David S. The coconut and its products, with special reference to Ceylon.

No. 3, June, 1914

* Dalburg, F. A., and * Pratt, Wallace E. The iron ores of Bulacan Province, P. I.
Eddingfield, F. T. Microscopic study of the Bulacan iron ores.
Editorial: Notes on the geology of Port Arthur and vicinity.
Reviews.

No. 4, August, 1914

* Cox, Alvin J., * Heise, George W., and * Gana, V. Q. Water supplies in the Philippine Islands.

No. 5, October, 1914

* Brown, William H., and Mathews, Donald M. Philippine dipterocarp forests.

No. 6, December, 1914

* Brown, William H., and Mathews, Donald M. Philippine dipterocarp forests (concluded).

SECTION B. TROPICAL MEDICINE

No. 1, February, 1914

* Barber, M. A. Cockroaches and ants as carriers of the vibrios of Asiatic cholera.
Heiser, Victor G. Reappearance of plague in the Philippines after an absence of six years. Brief description of the outbreak, the methods used to combat it, and the probable factors in its introduction.

Boynton, William Hutchins. A preliminary report of experiments on the cultivation of the virus of rinderpest in vitro.

———. An atypical case of rinderpest in a carabao.

Ward, Archibald R., Wood, Frederick Willan, and Boynton, William Hutchins. Experiments upon the transmission of rinderpest.

* Willets, David G. Intestinal parasitism, particularly entamœbiasis, in patients of the Philippine General Hospital, Manila, P. I.

———. Preliminary report on the treatment of entamœbiasis with ipecac, emetine, and neosalvarsan at the Philippine General Hospital, Manila, P. I.

Gibson, R. B., and Concepcion, Isabelo. Nerve degeneration in fowls fed on unhusked rice (palay).

Ward, Archibald R., and Wood, Frederick Willan. Simultaneous method of inoculating cattle and carabao with serum from animals that have been recently immunized.

No. 2, April, 1914

A Joint Commission of Representatives from the College of Medicine and Surgery, University of the Philippines; Bureau of Science; and Bureau of Health. Sanitary survey of the San Josè Estate and adjacent properties on Mindoro Island, Philippine Islands, with special reference to the epidemiology of malaria.

No. 3, June, 1914

Calderon, Fernando. Some data concerning the medical geography of the Philippines.

* Schöbl, Otto. The etiology of trichomycosis palmellina in the Philippine Islands.

* Johnston, John A. A contribution to the bacteriology of leprosy. Preliminary note.

* Willets, David G. Intestinal helminthiasis in the Philippine Islands as indicated by examinations of prisoners upon admission to Bilibid Prison, Manila, P. I.

Musgrave, W. E., and Sison, A. G. Bacillary dysentery: The most prevalent form in Manila and its treatment.

* Willets, David G. Widal reactions among healthy adult Filipinos.

Boynton, William Hutchins. Experiments on the cultivation of rinderpest virus as described by Baldrey.

———. Kidney-worm infestation of swine in the Philippine Islands with special reference to the pathological changes.

Light, S. F. Another dangerous jellyfish in Philippine waters.

Gibson, R. B. Some simple laboratory apparatus.

Reviews.

No. 4, August, 1914

* Barber, Marshall A. The pipette method in the isolation of single microorganisms and in the inoculation of substances into living cells. With a technique for dissection, staining, and other processes carried out under the higher powers of the microscope.

* Crowell, B. C. Notes on the diagnosis of Asiatic cholera at autopsy.

Gutierrez, Perpetuo. Typhoid fever in the Philippines.

Reviews.

No. 5, October, 1914

* Walker, Ernest Linwood, and *Barber, Marshall A. The transmission of malaria in the Philippine Islands. I. Experiments with Anopheles (Myzomyia) febrifer sp. nov., Anopheles (Pseudomyzomyia) rossii, Anopheles (Myzorhynchus) barbirostris, Anopheles (Myzorhynchus) sinensis, and Anopheles (Nyssorhynchus) maculatus.
* Willets, David G. Malaria in the Philippine General Hospital, Manila, P. I., during the fiscal year 1913.
* Crowell, B. C. The chief intestinal lesions encountered in one thousand consecutive autopsies in Manila.
Reviews.

No. 6, December, 1914

* Ruediger, E. H. The germicidal power of glycerin on various microörganisms under various conditions.
* Schöbl, Otto. The vitality of the cholera vibro in Manila waters.
* Walker, Ernest Linwood. The morphology of the adults of the Filaria found in the Philippine Islands.
Acosta-Sison, Honoria. Pelvimetry and cephalometry among Filipinas.
Gibson, R. B. A note on the physiological action of the proteoses.
———, and Concepcion, Isabelo. The lymphagogic action of the Philippine mango, Mangifera indica Linnæus.
Concepcion, Isabelo. Observations on mango rash.
* Barber, M. A. Milk poisoning due to a type of Staphylococcus albus occurring in the udder of a healthy cow.
Reviews.

SECTION C. BOTANY

No. 1, February, 1914

Copeland, Edwin Bingham. New Papuan ferns.
Ames, Oakes. The orchids of Guam.
* Merrill, E. D. An enumeration of the plants of Guam.

No. 2, April, 1914

* Merrill, E. D. An enumeration of the plants of Guam (concluded).
Sydow, H. and P. Fungi from northern Palawan.

No. 3, June, 1914

* Merrill, E. D. Charles Budd Robinson, jr.
* Robinson, C. B. The geographic distribution of Philippine mosses.
Campbell, D. H. The genus Macroglossum Copeland.
Copeland, E. B. New Sumatran ferns.
* Graff, P. W. Philippine Basidiomycetes, II.
Hubbard, F. T. A new species of Rottboelia.
Ostenfeld, C. H. New or noteworthy aquatic plants.
* Merrill, E. D. New or noteworthy Philippine plants, X.

No. 4, August, 1914

* Merrill, E. D. New or noteworthy Philippine plants, X (concluded).
Bennett, A. The Potamogetons of the Philippine Islands.
Bresadola, G. and Sydow, H. Enumeration of Philippine Basidiomycetes.
* Merrill, E. D. Plantae Wenzelianae, II.

No. 5, October, 1914

Gates, Frank C. The pioneer vegetation of Taal Volcano.
Copeland, Edwin Bingham. Hawaiian ferns collected by M. l'Abbé U. Faurie.
* Merrill, E. D. Sertulum Bontocense: New or interesting plants collected in Bontoc Subprovince, Luzon, by Father Morice Vanoverbergh, II.
———. Notes on Philippine Euphorbiaceae, II.

No. 6, December, 1914

Gates, Frank C. Swamp vegetation in hot springs areas at Los Baños, Laguna, P. I.
* Merrill, E. D. New species of Eugenia.
———. New species of Schefflera.
———. Dilleniaceae novae.
———. Meliaceae novae.

SECTION D. GENERAL BIOLOGY, ETHNOLOGY, AND ANTHROPOLOGY

No. 1, February, 1914

* Seale, Alvin. Preservation of commercial fish and fishery products in the tropics.
Day, Artemas L. The osseous system of Ophiocephalus striatus Bloch.
Worcester, Dean C. Note on the occurrence of a flying crustacean in the Philippine Islands.
* Seale, Alvin. Fishes of Hongkong.
Kerremans, Ch. Buprestides recueillis aux îles Philippines par C. F. Baker, I.
* Schultze, W. Notes on the Malay pangolin, Manis javanica Desmarest.

No. 2, April, 1914

* Christie, Emerson B. Notes on irrigation and coöperative irrigation societies in Ilocos Norte.
———. Notes on the pottery industry in San Nicolas, Ilocos Norte.
Cain, Andrew W. History of the Spanish Normal School for men teachers in Manila 1865–1905.
Melichar, L. Neue Homopteren von den Philippinen.
Kieffer, J. J. Nouveaux Cynipides des Philippines.
Day, Artemas L. Two new cyprinoid fishes of the genus Barbus from Lake Manguao, Palawan, P. I.

No. 3, June, 1914

Light, S. F. Some Philippine Scyphomedusæ, including two new genera, five new species, and one new variety.
———. Notes on Philippine Alcyonaria. Part II: Lemnalioides kükenthali, a new genus and species of Alcyonaria from the Philippines and a discussion of the systematic position of the new genus.
Wileman, A. E. Notes on Japanese Lepidoptera and their larvæ: Part I.
Melichar, L. Neue Fulgoriden von den Philippinen: I. Theil.
Kieffer, J. J. Enumération des Serphides (Proctotrupides) des îles Philippines avec description de genres nouveaux et d'espèces nouvelles.
* Schultze, W. Notes on a nesting place of Crocodilus palustris Lesson.

No. 4, August, 1914

Cowles, R. P. Palaemons of the Philippine Islands.
* Banks, Charles S. A new Philippine malaria mosquito.
Crawford, J. C. New Philippine Hymenoptera.

No. 5, October, 1914

Kemp, Stanley. On a collection of stomatopod crustacea from the Philippine Islands.
Baker, C. F. Studies in Philippine Jassoidea. I. Some remarkable Tettigoniellidæ.
Bickhardt, H. Philippinische Histeriden: I.
Fleutiaux, Ed. Elateridæ des îles Philippines.
Raffray, A. Catalogue des psélaphides (Coleoptères) des îles Philippines.
Melichar, L. Neue Homopteren der Philippinen.

No. 6, December, 1914

Robertson, James A. The Igorots of Lepanto.
* McGregor, Richard C. Description of a new species of Prionochilus from the highlands of Luzon.
Grouvelle, A. Nitidulidæ des Philippines recoltés par C. F. Baker.

A bulky report of the Committee for the Investigation of the Cause of Excessive Infant Mortality in the Philippine Islands was edited and the proof was read. This publication was to appear as No. 6 in the Bureau of Science series of publications, but there has been some delay in the issue.

The Mineral Resources of the Philippine Islands for 1913 was issued during the year 1914, and copy for a new publications folder has been sent to press and should appear within a short time.

More or less work has been done on several manuscripts, most of which have not been sent to the printer. These are:

Schultze, W. A catalogue of the Coleoptera of the Philippine Islands.
Beyer, H. O. The Ifugao people.
Christie, E. B. The Ilocano people.
Garvan, J. M. The Manobos of Eastern Mindanao.
Livingston, C. E. The tarsila of Maguindanao.
Merrill, E. D. A critical consideration of the species described by Blanco and Llanos.
Graff, P. W. Bibliographic list of Philippine Basidiomycetes.

A 38-page folder, entitled "Industrial resources of the Philippine Islands," was issued in English and in Spanish early in the year, giving semipopular and bibliographical information on the following subjects which have been studied by members or are included in the work of the Bureau of Science:

Chemical Technology.—Sugar; The nipa palm; Palm brandy; Starch; Coconut and coconut products; Other vegetable oils; The perfume industry, essential oils, and terpenes; Papaya gum; Tanning materials; Philippine dyes; Paper pulp; Soils.

Limestone and silicate industries.—Portland cement; Sand-lime products; Lime; Fire clay; Vitrified and other clay products.

Nonmetallic mineral resources.—Abrasives; Alum; Artesian water; Asbestos; Clay products; Cement raw materials; Coal; Producer-gas plant; Corundum; Gems and precious stones; Guano and phosphates; Gypsum; Limestone; Manganese; Mica and talc; Mineral pitch; Mineral waters; Ocher; Petroleum and gas; Salt; Sand and gravel; Stone; Sulphur.

Metallic mineral resources.—Gold; Silver and lead; Copper; Iron and iron ore; Chromic iron; Antimony.

Bacteriology.

Botany.—Hats and hat making; Medicinal plants; Fungi; Coffee.

Entomology.—Cacao; Tobacco; Silk; Honey.

Fisheries.—Fish ponds; Food and game fishes; Pearl fisheries; Button shells; Window shell; Trepang (bêche de mer); Shark fin; Tortoise shell; Sponges; Edible seaweed and isinglass; Fish culture; Preserving fishery products.

Philippine birds.—Game birds.

Library.

Aquarium.

Manuscripts giving more extensive information on similar subjects were furnished for publication as folders for the Philippine Exhibit at the Panama-Pacific International Exposition. (See page 53.)

The Bureau of Science press bulletins have been useful in stimulating the interest of the public in the work which the Bureau of Science can do for it and in distributing useful information. The press bulletins issued are as follows:

Serial No.	Subject.	Date of issue.
17	Petroleum on Bondoc Peninsula, Tayabas Province, Philippines	July 9, 1913
18	Black bass fry for distribution	Sept. 1, 1913
19	The geology and petroleum resources of the southern part of Bondoc Peninsula, Tayabas Province, Philippines	Sept. 8, 1913
20	Amœbic dysentery	Sept. 25, 1913
21	Mosquito fish	Nov. 5, 1913
22	The Bureau of Science discovers gold in the drill cuttings from an artesian well at Casiguran, Sorsogon	Dec. 5, 1913
23	Coconut insects in the Philippine Islands	Jan. 3, 1914
24	Recent progress in the study of beriberi	Mar. 26, 1914
25	Statistics of production	Apr. 24, 1914
26	Circular sent to druggists with regard to extract of tiqui-tiqui	
27	Bacteria in Manila water supply	July 25, 1914
28	Rabies or hydrophobia. (English and Spanish)	July 29, 1914
29	On recent studies of beriberi	Aug. 3, 1914
30	The cigarette beetle. (English and Spanish)	Aug. 18, 1914
31	The molds of cigars and their prevention. (English and Spanish)	Sept. 19, 1914
32	Birds in their economic relation to man through agriculture and forestry. (English and Spanish)	Sept. 28, 1914
33	Report on the possible shortage of cyanide	Oct. 19, 1914
34	Report on fisheries of Mindanao and Sulu	Dec. 15, 1914

A series of colored post cards and a booklet of some of the most brillant and curious Philippine fishes are being issued for sale at the aquarium.

The necessary number of blanks and labels have been printed.

The mailing list for the Journal for the past three years has been as follows:

	1912	1913	1914
Paid subscriptions	341	447	347
Exchanges	400	427	465
Reviews	68	74	64
Free	46	49	49
Total mailing list	855	997	925

There has been a decrease in the number of paid subscriptions. This may be attributed to the European war, there having been practically no business transacted with any of the warring countries, except Great Britain, since last July and to a lack of funds for advertising. The mailing list has been thoroughly revised, which has helped to reduce the number of names remaining on the list.

It is difficult to keep the varied and widely scattered Journal accounts paid up. A follow-up system, as mechanical as it can be made under the circumstances, has been put into effect recently to secure more prompt settlements. The outstanding accounts at present amount to ₱1,399.65 as against ₱1,495.96 for the year 1913, which shows some improvement even in a short time. The cost of printing the Journal for the first eleven months of this year amounts to ₱20,785.33, which indicates a somewhat less annual cost than formerly.

CLERICAL DIVISION

Miss Celesta Cromer, stenographer to the Director, resigned effective August 29, 1913, and her place was taken by Miss L. Soriano, a Filipino junior stenographer. This step was taken in the interest of the Filipinization of the service and as an opportunity to train a Filipino stenographer in broader and more original lines of clerical work. The Filipino stenographer lacks the thorough knowledge of English and the many years of business experience of Miss Cromer, but by exercising personal supervision of some of the details she has performed the routine stenographic and clerical duties of the office as well as was expected and has improved remarkably during the past year.

An American stenographer, who is occasionally called upon to help out on extra and rush work, is available in the general office. Mr. Grady P. Oakly left the Bureau in October, and his position was dropped. Mr. A. E. Southard, chief clerk, was detailed as private secretary to the Honorable, the Secretary of the Interior, on August 16, 1914, for the remainder of the year. Two years ago there were five Americans in the clerical division as against three authorized places at the present time—namely, the chief clerk, a stenographer detailed to the accounting office and supervision of the files, and the cashier and disbursing and property officer—a reduction of 40 per cent. Our Filipino stenographers have done very good work, but the facts that English is not their native language and that they are inexperienced in general business and office work limit their ability to combine speed with accuracy, although they show decided improvement from year to year. For this reason it will be impossible further to reduce the American personnel of this division.

The files are still in an unfinished condition, although a large amount of work has been done upon them. Mr. Evans has been detailed to supervise the filing, and under his direction the files can be brought up to date within the coming year.

The work of the sample clerk increased so much that it was impossible for him to keep up with it unless he worked from twelve to fourteen hours a day. His work has been divided and the minor part given to an assistant.

I am convinced that the plan of dividing our allotment for clerical hire among fewer clerks, which enables us to pay sufficiently high rates of compensation to attract the more efficient men, is most economical.

A large amount of extra work has been required of the property section on account of the necessity of checking all the specimens that were sent to the Panama-Pacific International Exposition.

The care of the lawns, hedges, etc., formerly done by the city of Manila at our expense, has been taken over by the Bureau as a measure of economy. The telephone service is still the cause of some complaint. A new switchboard has been installed, but the operator reports that it is often out of order. The muchacho service has continued to be satisfactory since the adoption, about three years ago, of the present rules and regulations governing that matter.

PHOTOGRAPHY

The record of the photographic work is as follows:

Kind of work.	July 1 to Dec. 31, 1913.	Calendar year 1914.
Negatives taken	473	458
Lantern slides	974	875
Prints, 5 by 7 inches	7,503	10,718
Enlargements, 14 by 17 inches	116	262
Transparencies, 8 by 10 inches	86	53

AQUARIUM

The aquarium of the Bureau of Science is situated in Manila on Calle Gral. Luna (Palacio) within the bastion of the Real Gate of the old Walled City, and the grounds have been parked and are very attractive.

The building is a substantial one-story structure of reënforced concrete, and follows the outline of the old bastion, which is that of an irregular pentagon. It consists of a single corridor or tunnel, 57 meters (275 feet) long and 8 meters (25 feet) wide. There are 27 exhibition tanks, each of which is faced with plate glass 1 inch thick, set in solid iron frames 1 by 2 meters (3.25 by 6.5 feet), and lighted by skylights, one over each tank. The backs of the tanks slope, so there are no unlighted corners, and practically all the light in the corridor comes through the tanks, which allows a most satisfactory view of the fishes. Louvers placed above the tanks and in the opposite wall provide ventilation and render the corridor cool. Electric lights placed near the skylights provide light for evening displays. There are two large tanks about 12 meters (40 feet) in diameter outside of the corridor—one for crocodiles and the other for large fishes, sharks, or turtles, which may be seen from within the corridor and present a pleasing grotto effect.

The storage tanks are provided with a capacity of 95,000 liters (25,000 gallons) of water. The closed circulation system is used. The water is returned to the supply tank from the aquaria through sand filters by means of an electric pump, and the water is used over and over again. This is the same system as is used in the New York Aquarium. Each aquarium is equipped so it can be supplied with fresh water and air as well as salt water. A lead salt-water pipe system is used throughout to prevent corrosion.

The aquarium was opened in February during the 1914 Philippine Exposition. In the exhibition tanks we maintain a large and complete display of curious and bright-colored fishes, sea anemones, crabs, sea urchins, starfishes, and other representatives of the wonderful and interesting forms of marine life found in the tropical waters of the Philippine Islands. The two large tanks outside of the corridor are stocked with crocodiles, turtles, and large fishes. A certain number of goldfishes and other fresh water fishes are on display. In the aquarium at present there are 756 specimens representing 154 species of fishes, 10 species of crabs, 3 species of suckers, 2 species of turtles, and a number of species of prawns and other shellfishes. The aquarium is one of the best of its kind in the world. Stone steps lead to the top of the old bastion wall, from which a fine view of the harbor, shipping, Luneta, and bay shore can be obtained. The aquarium is self-supporting. Since it was opened there have been 33,621 paid and 28,052 free admissions. The latter consist of those who attended during the opening days and when we had certain free days, and of students and teachers of schools who have been admitted by special arrangement.

BUREAU OF SCIENCE EXHIBIT AT THE 1914 PHILIPPINE EXPOSITION

The Second Philippine Exposition was held in Manila, February 7 to 15, 1914. It is very difficult properly to represent the various activities of the Bureau of Science at an exposition for the reason that much of the work is of such a nature that it does not lend itself to exposition purposes. However, a very interesting exhibit was displayed, and the Bureau received a beautiful silver tablet bearing the coat-of-arms of the Government of the Philippine Islands which reads as follows:

> Awarded by the Philippine Exposition Board to the Bureau of Science for its exhibit at the Philippine Exposition of 1914 of the industrial resources of the Philippines, including calcareous and siliceous, nipa and other chemical products, mining and minerals, botany, ethnology, fishery, silk and bird exhibits, and for educational models and apparatus.

A full account of the Bureau of Science exhibit at the 1914 Philippine Exposition was published in the Philippine Agricultural Review (1914), 7, No. 4, April, 156–66.

PANAMA-PACIFIC INTERNATIONAL EXPOSITION EXHIBIT

The Bureau of Science sent to San Francisco for the Panama-Pacific International Exposition to be held February to December, 1915, 72 large packing cases filled with exhibits for the 3,946 square feet (366.5 square meters) of floor space allotted to us in the Philippine building. The Bureau of Science display consists of nearly 4,000 items representing (1) applied chemistry in Philippine industry, including numerous samples of wood, distillates and charcoals, tan barks, tanning cutch and tanned hides, paper made from local fibers, fruit products, essences, oils and beverages, information with regard to Philippine water supply from sanitary and commercial standpoints, Philippine coals, their analyses and results of physical and chemical tests, cement and concrete, limestone and lime from local resources, sand-lime bricks, tile, clay products and polished artificial marbles made from Philippine raw materials, various products from leaves—for example, roselle—and nipa palm and its products; (2) Philippine mineral resources and geology, including ores, coal, corals, fossils, and shells, models of Philippine processes and of gold production by years, relief maps, geologic maps, mineralogic maps, charts showing economic mineral products by years and distribution, and photographs; (3) Philippine ethnology, portraying the culture, social life, ceremonies, industries, and occupations of people in the Philippines, including everything from small ornaments, cloths, and garments to weaving looms, household utensiles, tools, agricultural implements, fishing boats, and even models of their houses, and miscellaneous industries, such as fish, silk, hemp, rope, basket, and hat making; (4) Philippine economic fishery products and resources, including food and game fishes, window and button shells, tortoise shell, and sponges; (5) Mounted Philippine botanical specimens; (6) an exhibit of the Philippine Journal of Science; and (7) scientific photographic collection and colored transparencies portraying the various types of Philippine tropical diseases and illustrating the Philippine Islands. The exhibit was shipped to San Francisco on November 7 and 15, 1914.

PANAMA-PACIFIC INTERNATIONAL EXPOSITION FILMS

The Bureau of Science has made over 10,000 feet of moving picture films of industrial, commercial, and scenic subjects in the Philippine Islands for the Philippine Board of the Panama-Pacific International Exposition to be held in San Francisco February to December, 1915. The subjects are:

Sugar: Cane planting, cultivating, cutting, transporting to mill, native evaporating plant, modern mill, sacking, and shipping.

Abacá (Manila hemp): Transplanting, cultivating, felling, stripping, drying, pressing and baling, transporting, classifying, and loading for transportation.

Coconuts and coconut products: A coconut grove, gathering, transporting in small boats and rafts, husking and opening coconuts, drying copra (coconut meat partly dried), sacking, shipping, Filipino method of making coconut oil, and modern oil mill.

Minor industries: Pillow lace making in Bilibid Prison, paper flower making in Concordia Convent, match factory, nipa alcohol distillery, etc.

Pagsanjan Falls.
The modern Fire Department of the city of Manila.
Views in Manila and vicinity: Central Private School for girls, Jesuit fathers with scholars, Tondo market, the estero traffic, shipping on Pasig River, Bridge of Spain, the Escolta, Plaza Moraga, Santa Cruz Bridge, Plaza Goiti.
Public school children: Including those in Cavite and Laguna Provinces and the city of Manila, and some of the industries taught in the schools.

MANUSCRIPTS FOR THE PHILIPPINE BOARD OF THE PANAMA-PACIFIC INTERNATIONAL EXPOSITION

Semipopular accounts of a great variety of industries, some of which can be developed as the result of investigations of the Bureau of Science, have been prepared for publication as folders of the Philippine exhibit at the Panama-Pacific International Exposition. The subjects treated are in many cases the same as those discussed in my Annual Report for 1913 and in our folder, Industrial resources of the Philippine Islands, published early in the year, in which a great many more subjects were less extensively treated. The subjects of manuscripts prepared for the exposition are as follows:

Vegetable and essential oils.
Medicinal plants.
The vegetation of the Philippines.
Paper materials.
Sugar and alcohol from palm saps.
Mangrove swamps.
Resin, turpentine, and wood distillates.
Papaya gum.
Gold.
Cement raw materials.
Iron-ore deposits.
Petroleum, natural gas, and asphalt.
Pearl fisheries; button and window shells.
Coal deposits.
Lime and lime products.
Copper and manganese.
Stone, sand, and gravel.
Clay and clay products.
Sulphur deposits.
Minor metallic resources.
Miscellaneous nonmetals.
Possibilities of a modern salt plant.
Leather industry.
Food and game fishes.
Game birds.
Tortoise shell, bêche de mer, shark fin, and sponges.

RECOMMENDATIONS

During the past calendar year we have had available for the work of the Bureau of Science ₱381,084.

In my annual report for 1913 I pointed out that the work of maintaining a constantly growing Bureau which is in effect a department of information has seriously handicapped us in carrying on new lines of investigation as well as completing those which have already been begun. We are in the greatest need of more scientific employees and equipment to handle the additional work which has devolved upon us. During each of the three years in which I have been in charge of the Bureau of Science there has been an increase in the amount of work and a decrease in the number of authorized civil service positions in the Bureau. It follows that the research of the Bureau most necessary for the industrial, economic, and sanitary development of the Philippine Islands must suffer unless its routine work is reduced or funds available are increased. In spite of the large amount of routine work, the researches of the Bureau have been extensive and have included such problems as the investigation of plague, cholera, bacillary dysentery, tuberculosis, leprosy, balantidiasis, malaria, beriberi, and other diseases of man; problems of immunity and tropical sanitation; the eradication of household and other insect pests; and the investigation of sugar, the nipa palm, palm brandy, starch, coconuts and coconut products, other vegetable oils, the perfume industry, essential oils, terpenes, papaya gum, tanning materials, Philippine dyes, paper pulp, soils, Portland cement, sand-lime products, lime, fire clay, vitrified and other clay products, abrasives, alum, artesian water, asbestos, clay products, cement raw materials, coal, producer-gas plant, corundum, gems and precious stones, guano and phosphates, gypsum, limestone, manganese, mica and talc, mineral pitch, mineral waters, ocher, petroleum and gas, salt, sand and gravel, stone, sulphur, gold, silver, lead, copper, iron and iron ore, chromic iron, antimony, hats and hat making, medicinal plants, fungi, coffee, cacao, tobacco, silk, honey, fish ponds, food and game fishes, pearl fisheries, button shells, window shell, trepang (bêche de mer), shark fin, tortoise shell, sponges, edible seaweed and isinglass, fish culture, preserving fishery products, game birds, etc. The Philippine Islands need this class of research, and the legislature should give this work its support in order to protect and build up the public health and in order that capitalists may be shown where to invest. Such a large volume of work as has been accomplished during the past year could not have been accomplished by so few men during official hours. Men will not remain indefinitely under these conditions. It is unfair to reduce the staff so much that it is necessary to put in much overtime to complete the work. To attract and hold good men, opportunities for constructive work must be presented; no scientific man is willing indefinitely to devote the bulk of his time to purely routine work. The routine work in certain sections of the Bureau of Science is overwhelming our depleted force, rendering it difficult or practically impossible to attain constructive results. If the work is to progress at all, it is necessary that additional employees be added to the staff. The present appropriation to the Bureau of Science is the basis of retaining that which we have already accomplished rather than being sufficient as a basis of progressive work. In view of the decreased revenue of the Government, this is satisfactory as a temporary measure, but if the Bureau of Science is to lead the industrial development of the Philippine Islands as it should do in order to prevent extensive duplication and waste, a larger appropriation should be made.

Renewed recommendation.—Time has made no less desirable many of the things recommended in my annual reports for the last two years. A new wing is urgently needed to provide adequate quarters for the testing of cement, reënforced iron, steel, rope, wire, road materials, tiles, cement pipes, concrete, mortar, building blocks, bricks, stone, and cloth, and to supply other additional room. Attention has repeatedly been called to the desirability of protecting the exceedingly valuable herbarium of the Bureau of Science against possible destruction by fire. The main building of the Bureau of Science is far from fireproof, and fires are notoriously common in buildings in which chemical investigations are carried on. The number of fires that have occurred in the Bureau of Science is considerable, and one during the last year was serious. In its present location, the herbarium, in case of fire, would be a total loss, especially should the fire gain headway in the attic of the building. Ordinary libraries, scientific instruments, etc., can be replaced in case of destruction. Scientific collections, such as herbaria, if once destroyed can never be replaced. Other collections can be built up, but new collections can never have the same value, scientific or otherwise, as older ones, like that of the Bureau of Science herbarium which contains a high percentage of types and cotypes.

As already pointed out, funds for a soil survey, the investigation of the subject of animal diseases, of insects injurious to agricultural products, a water survey, the purchase of books necessary to complete sets now in the central scientific library, reissuing of exhausted editions of certain publications, and enlarging the scope of our present work on the fish and fisheries of the Philippine Islands are needed. As heretofore, I heartily recommend that an appropriation for these purposes be made when funds are available.

Philippine flora.—Mr. Merrill has continued his work on geographic distribution and classification, taking up economic phases of the subject as occasion arises. Data and material have accumulated to such an extent that it is highly desirable that work be commenced on a comprehensive systematic enumeration of Philippine plants, or perhaps on the preparation of a comprehensive flora of the Philippines. Such a work would gather up all the data that are available on the distribution of the numerous species both in the Philippines and outside of the Archipelago. The value of such a work would be great, for it would not only record valid native names and most important uses and make available in compact form all the results of our twelve years work on the classification and taxonomy of 7,500 species of Philippine flowering plants and ferns, practically all of which are represented in the collections of the Bureau of Science, but also that of all other botanists who have worked on the flora of the region, information which is now found scattered through hundreds of separate articles in the botanical literature of America, Europe, Asia, and Australia. With the reduction in the Bureau staff, the increase in routine work, and the increase in duties of instruction at the University, it has been quite impossible to begin this work. Desirable as it is, nothing can be done on the subject until our botanical force is increased and Mr. Merrill is relieved of a part of his duties at the University. With a force of but two men, one of whom is in the field practically all of the time, it is a manifestly impossible task to keep up the routine work of the herbarium, prepare and edit the manuscripts of the section of botany of the Philippine Journal of Science, teach from nine to eighteen hours per week at the University, and do anything else. Under present conditions economic problems must be slighted, and some very important phases of economic work ignored. Due to the familiarity of Mr. E. D. Merrill, the chief botanist, with the Philippine flora, the work of preparation of the manuscript will be comparatively easy, and no other botanist is in a position to undertake such a task without many years of previous experience on the Philippine and Malayan floras; therefore I recommend that the personnel be increased to permit Mr. Merrill to prepare this manuscript and that ₱2,000 be made available during the calendar year 1916 for printing the same.

Robinson memorial.—You are already familiar with the work of Dr. C. B. Robinson and the circumstances concerning his death. Up to the time of his death he had submitted 125 pages of a single-space typewritten progress report. This information is of the greatest scientific value, and this, together with work now being and yet to be done upon his collection brought from Buitenzorg by the chief botanist, should be published as a memorial to him. The interest in this publication will not be for the Philippines alone, and I have no doubt that the publication will sell extensively and that the money expended in printing it will be recovered through sale in a short time. Therefore I have the honor to recommend that ₱2,000 be appropriated for the purpose of publishing this work as a memorial volume to Doctor Robinson, whose life was sacrificed in collecting the material.

Iloilo sugar laboratory.—My last annual report gives a clear idea of the routine work of the laboratory and of the large amount of instruction with regard to planting and harvesting of cane, as well as the perfect recovery of the sugar which has been given. The records of the past year and a half show the eagerness with which both producers and dealers avail themselves of umpire polariscopic analyses in case of dispute and as a basis for valuation. Each year impresses us more thoroughly with the thousands of pesos which could be saved annually to the sugar growers if they had the scientific information necessary with regard to planting, harvesting, and recovering the sugar most efficiently and economically.

Last year I pointed out the need for a model central sugar mill at Iloilo. There are more and more central mills being erected throughout the country, but the deplorable lack of knowledge at some of the haciendas of the chemical processes involved in boiling sugar makes it desirable that men be trained to operate them. If funds are available, it would be an excellent investment for the Government to build and operate a model central mill and to use it in showing the people how the work should be carried on. The work of the sugar laboratory in Iloilo should be extended, and we should have enough trained men to send throughout the provinces to give instruction relative to the best chemical processes of handling cane juice.

There is a large amount of other important sugar work which should be inaugurated. There is no definite information as to what variety of cane is most desirable to plant. One variety is noted for its sweetness, another for the size of the stalk, and so on. The results obtained from different varieties in their home countries are often very different from those in other lands. It frequently happens that a given variety does well only on one kind of soil and in a given climate. The methods of planting, fertilizing, irrigating, and cultivating need further study. The various problems in cane culture can be solved only by trial with careful chemical analysis of the soil and chemical analysis of the cane to determine the purity, fiber, and tonnage.

Restriction of useless routine work.—I called attention to the desirability of eliminating useless routine work on page 14 of my annual report for the year ending June 30, 1913, and also in response to a question of the committee appointed on July 10, 1913, by his Excellency, the Governor-General, "What provisions of law, regulations, or requirements of other bureaus cause you unnecessary expense?"

The following will illustrate what might be done in this line. The amœbæ which multiply in surface water are incapable of living as parasites in the intestines of man, and consequently are not concerned in the production of dysentery. It follows that the mere presence or absence of amœbæ has little sanitary significance, and the examination should be omitted where practicable. The purity of a paint does not fix its value as a protective coating, the percentage of chlorine does not establish the potability of water, and the bacteria count of water several hours in transit to the laboratory, unless packed on ice, has no value. Many requests for routine work are founded on a false impression of the value of the specified test. We are expected from the examination of individual samples and from the results obtained to draw conclusions which would be justified only after extended investigation and without which the analyses have no significance. On the other hand, requests for elaborate investigations are sometimes received when simple tests would suffice if the problems were made clear. Frequently the problem is of momentary interest and relatively little value and requires time and energy which should be available for more important results. My endeavors to discourage requests for analyses and examinations of doubtful value have not always been successful. With our reduced staff, unimportant routine work should not be done.

Tables showing the routine work performed and supplies manufactured and disposed of during the half year from July 1 to December 31, 1913, and during the calendar year 1914, by the Bureau of Science, and a financial statement showing the appropriation and how it was expended are attached hereto.

ALVIN J. COX,
Director, Bureau of Science.

To the Honorable,
The SECRETARY OF THE INTERIOR.

TABLE I.—*Comparative table of routine work performed and supplies manufactured and disposed of during the six months ended December 31, 1913, and during the calendar year 1914, as compared with the fiscal year 1913 (July 1, 1912, to June 30, 1913), by number or quantity and by value, arranged by subdivisions of the Bureau of Science.*

Subdivision of the Bureau of Science.	Samples or units.			Free.			Cash.			Total.		
	Fiscal year 1913.	Six months ended Dec. 31, 1913.	Calendar year 1914.	Fiscal year 1913.	Six months ended Dec. 31, 1913.	Calendar year 1914.	Fiscal year 1913.	Six months ended Dec. 31, 1913.	Calendar year 1914.	Fiscal year 1913.	Six months ended Dec. 31, 1913.	Calendar year 1914.
General, inorganic, and physical chemistry.				*Pesos.*	*Pesos.*	*Pesos.*	*Pesos.*	*Pesos.*	*Pesos.*	*Pesos.*	*Pesos.*	*Pesos.*
Metals and alloys	45	14	51	201.50	41.00	98.00	273.10	58.51	436.50	474.60	99.51	534.50
Rocks, minerals, natural pigments, and similar substances	15	3		122.50	24.00		20.00			142.50	24.00	
Clays, shales, limestones, limes, wall plasters, cement, and slags	55	31	11	354.00	199.60	118.00	265.50	60.00	27.00	619.50	259.60	145.00
Fertilizers	10	9	14		30.00	27.00	108.00	59.00	132.00	108.00	89.00	159.00
Soils and similar substances	14	7	42	219.00	106.00	305.00	35.00	45.00	693.00	254.00	151.00	998.00
Coal analyses	58	3	22	615.00		45.00	173.00	29.00	276.00	788.00	29.00	321.00
Calorimetric tests of fuels	42	7	7	480.00	40.00	20.00	140.00	106.00	120.00	620.00	146.00	140.00
Waters	187	126	208	4,785.00	3,667.50	3,795.00	640.00	331.00	365.00	5,425.00	3,998.50	4,160.00
Crude chemical and miscellaneous analyses	35	15	88	120.25	63.00	244.50	306.40	137.00	289.50	426.65	200.00	534.00
Standard solutions	10	28	30	60.00	136.00	167.00	10.00	382.50	29.00	70.00	518.50	196.00
Physical test of wire, twin, fiber, textile, paper, and similar articles	48	16	31	33.00	58.00		157.00	8.00	90.50	190.00	66.00	90.50
Cements	9,535	5,093	6,817				9,129.05	6,356.85	7,641.20	9,129.05	6,356.85	7,641.20

TABLE I.—*Comparative table of routine work performed and supplies manufactured and disposed of, etc.*—Continued.

Subdivision of the Bureau of Science.	Samples or units.			Free.			Cash.			Total.		
	Fiscal year 1913.	Six months ended Dec. 31, 1913.	Calendar year 1914.	Fiscal year 1913.	Six months ended Dec. 31, 1913.	Calendar year 1914.	Fiscal year 1913.	Six months ended Dec. 31, 1913.	Calendar year 1914.	Fiscal year 1913.	Six months ended Dec. 31, 1913.	Calendar year 1914.
General, inorganic, and physical chemistry—Continued.				*Pesos.*	*Pesos.*	*Pesos.*	*Pesos.*	*Pesos.*	*Pesos.*	*Pesos.*	*Pesos.*	*Pesos.*
Compression, tensile, or transverse strength of concrete, stone, mortar, rope, iron and steel, etc.	54	136	86	3.00	162.50		268.00	207.00	330.00	271.00	369.50	330.00
Standardization of road materials	62	1	15	99.50			415.50	15.00	170.15	515.00	15.00	170.15
Standardization of units of measures:												
Length	96	349	171			0.10	67.20	245.00	88.50	67.20	245.00	88.60
Capacities	154	31	312	15.00			4.00	18.00	99.40	19.00	18.00	99.40
Weights	667	890	776	66.00			3.50	89.00	79.95	69.50	89.00	79.95
Miscellaneous	210	51	41	143.43	1.90		10.80	31.50	54.00	154.23	33.40	54.00
Total	11,297	6,810	8,722	7,317.18	4,529.50	4,819.60	12,026.05	8,178.36	10,921.70	19,343.23	12,707.86	15,741.30
Organic chemistry.												
Urines, clinical and toxicological analyses	2,666	82	223	479.00	202.00	600.00	1,513.00	156.00	469.00	1,992.00	358.00	1,069.00
Essential oils and essences	37	17	14	15.00	7.50	15.00	273.00	120.00	89.50	288.00	127.50	104.50
Petroleum and products, copra, and similar materials	71	10	65	307.50	68.00	317.50	177.50	90.00	89.50	485.00	158.00	407.00
Paints, varnishes, and linseed oils	46	33	41	43.00		48.50	327.50	172.50	319.00	370.50	172.50	367.50
Gums, resins, and similar materials	3	8		10.00			10.00	29.00		20.00	29.00	

Paper and similar materials	107	94	104	1, 223. 00	940. 00	1, 040. 00	--------	--------	--------	1, 223. 00	940. 00	1, 040. 00
Gastric juice, clinical examinations	12	19	52	250. 00	270. 00	540. 00	75. 00	15. 00	15. 00	325. 00	285. 00	555. 00
Foods, alcohols, and beverages	1, 035	440	582	11, 605. 00	3, 391. 00	2, 994. 00	914. 50	3, 160. 37	884. 00	12, 519. 50	6, 551. 37	3, 878. 00
Food preservatives and coloring matters	19	7	5	115. 00	90. 00	45. 00	14. 00	6. 00	4. 00	129. 00	96. 00	49. 00
Medicines and similar articles	232	43	38	1, 271. 00	370. 00	255. 00	93. 00	25. 00	140. 00	1, 364. 00	395. 00	395. 00
Miscellaneous chemical analyses and examinations	77	21	68	452. 00	95. 00	266. 00	96. 00	95. 00	100. 00	548. 00	190. 00	366. 00
Total	4, 305	774	1, 192	15, 770. 50	5, 433. 50	6, 121. 00	3, 493. 50	3, 868. 87	2, 110. 00	19, 264. 00	9, 302. 37	8, 231. 00
Mines.												
Assays	288	219	411	196. 00	--------	19. 00	598. 67	360. 50	653. 45	794. 67	360. 50	672. 45
Biological laboratory.												
Fæces	34, 530	24, 502	126, 226	273, 187. 00	322, 839. 00	2, 861, 707. 00	1, 147. 00	341. 00	1, 371. 00	274, 334. 00	323, 180. 00	2, 863, 078. 00
Sputum	5, 770	1, 919	2, 095	17, 177. 00	5, 691. 00	6, 177. 00	111. 00	68. 00	108. 00	17, 288. 00	5, 759. 00	6, 285. 00
Blood	25, 539	8, 780	6, 398	77, 970. 00	28, 376. 00	22, 206. 00	2, 816. 00	903. 00	422. 00	80, 786. 00	29, 279. 00	22, 628. 00
Blood culture	--------	185	392	--------	895. 00	1, 940. 00	--------	38. 00	20. 00	--------	933. 00	1, 960. 00
Widal test	--------	316	599	--------	948. 00	1, 770. 00	--------	--------	33. 00	--------	948. 00	1, 803. 00
Wassermann test	--------	798	1, 259	--------	6, 950. 00	9, 550. 00	--------	1, 030. 00	3, 040. 00	--------	7, 980. 00	12, 590. 00
Leprosy	--------	243	1, 132	--------	729. 00	3, 387. 00	--------	--------	9. 00	--------	729. 00	3, 396. 00
Urines	6, 974	5, 309	4, 275	26, 991. 00	15, 477. 00	12, 585. 00	--------	469. 00	242. 00	26, 991. 00	15, 946. 00	12, 827. 00
Gonococci	20, 522	8, 541	16, 379	54, 312. 00	25, 611. 00	49, 065. 00	18. 00	12. 00	72. 00	54, 330. 00	25, 623. 00	49, 137. 00
Waters	1, 077	1, 211	2, 243	41, 815. 00	48, 210. 00	83, 810. 00	750. 00	290. 00	320. 00	42, 565. 00	48, 500. 00	84, 130. 00
Necropsies	87	142	401	2, 519. 00	3, 550. 00	10, 025. 00	--------	--------	--------	2, 519. 00	3, 550. 00	10, 025. 00
Histological examinations	--------	322	256	--------	3, 190. 00	2, 480. 00	--------	30. 00	80. 00	--------	3, 220. 00	2, 560. 00
Rabies	--------	14	36	--------	--------	--------	--------	--------	--------	--------	--------	--------
Plague	--------	13	65	--------	39. 00	195. 00	--------	--------	--------	--------	39. 00	195. 00
Rats for plague	--------	27, 564	113, 337	--------	82, 692. 00	340, 011. 00	--------	--------	--------	--------	82, 692. 00	340, 011. 00
Miscellaneous biological examinations	57, 972	796	1, 755	172, 392. 00	2, 512. 00	8, 601. 00	85. 00	26. 00	548. 00	172, 477. 00	2, 538. 00	9, 149. 00
Total	152, 471	80, 655	276, 848	666, 363. 00	547, 709. 00	3, 413, 509. 00	4, 927. 00	3, 207. 00	6, 265. 00	671, 290. 00	550, 916. 00	3, 419, 774. 00

TABLE I.—*Comparative table of routine work performed and supplies manufactured and disposed of, etc.*—Continued.

Subdivision of the Bureau of Science.	Samples or units.			Free.			Cash.			Total.		
	Fiscal year 1913.	Six months ended Dec. 31, 1913.	Calendar year 1914.	Fiscal year 1913.	Six months ended Dec. 31, 1913.	Calendar year 1914.	Fiscal year 1913.	Six months ended Dec. 31, 1913.	Calendar year 1914.	Fiscal year 1913.	Six months ended Dec. 31, 1913.	Calendar year 1914.
Serum section of the biological laboratory.				*Pesos.*	*Pesos.*	*Pesos.*	*Pesos.*	*Pesos.*	*Pesos.*	*Pesos.*	*Pesos.*	*Pesos.*
Vaccine virus (doses)	2,419,723	1,337,669	2,636,335				28,876.55	13,676.54	29,383.05	28,876.55	13,676.54	29,383.05
Antirinderpest serum (cubic centimeters)	553,666.33	127,499.97	134,333.33				757.15	218.58	230.29	757.15	218.58	230.29
Mallein (doses)	280	711	815				345.70	513.00	545.50	245.70	513.00	545.50
Miscellaneous sera and preparations (cubic centimeters)	2,833,268	1,737,769	6,524,090				5,267.97	6,287.30	15,009.82	5,267.97	6,287.30	15,009.82
Total	5,806,937.33	3,203,648.97	9,295,573.33				35,147.37	20,695.42	45,168.66	35,147.37	20,695.42	45,168.66
Miscellaneous.												
Photographs	14,491	8,873	16,161	906.92	76.30	593.00	7,100.26	4,559.80	4,956.54	8,007.18	4,636.10	5,549.54
Natural history specimens	84	1	8				127.60	2.00	81.24	127.60	2.00	81.24
Shop work	269	218	208	2,456.07	1,050.13	1,212.16	344.20	238.50	1,154.23	2,800.27	1,288.63	2,366.39
Miscellaneous work	26	28	52				622.56	5,029.60	8,081.52	622.56	5,029.60	8,081.52
Sale of publications							6,364.71	1,881.14	3,433.16	6,364.71	1,881.14	3,433.16
Refunded work not done etc. (deducted)							(137.00)	(438.81)	(82.75)	(137.00)	(438.81)	(32.75)
Power, gas, etc							34,265.70	16,907.03	31,995.70	34,365.70	16,907.03	31,995.70
Total	14,880	9,120	16,429	3,362.99	1,126.43	1,805.16	48,688.03	28,179.26	49,619.64	52,051.02	29,305.69	51,425.80
Grand total	5,990,178.33	3,301,226.97	9,599,175.33	693,009.67	558,798.43	3,426,273.76	104,880.62	64,489.41	114,738.45	797,890.29	623,287.84	3,541,012.21

TABLE II.—*Comparative table of routine work performed and supplies manufactured and disposed of during the six months ending December 31, 1913, and during the calendar year 1914, as compared with the fiscal year 1913 (July 1, 1912, to June 30, 1913) by number or quantity and by value, arranged with reference to Government and other patronage.*

Patron.	Samples or units.			Free.			Cash.			Total.		
	Fiscal year 1913.	Six months ended Dec. 31, 1913.	Calendar year 1914.	Fiscal year 1913.	Six months ended Dec. 31, 1913.	Calendar year 1914.	Fiscal year 1913.	Six months ended Dec. 31, 1913.	Calendar year 1914.	Fiscal year 1913.	Six months ended Dec. 31, 1913.	Calendar year 1914.
Bureau of Agriculture.				*Pesos.*	*Pesos.*	*Pesos.*	*Pesos.*	*Pesos.*	*Pesos.*	*Pesos.*	*Pesos.*	*Pesos.*
Fertilizers		1	2		15.00	27.00					15.00	27.00
Soils and similar substances			11			275.00						275.00
Crude chemical and miscellaneous analyses		1			7.00						7.00	
Petroleum and products, copra, and similar materials			34			165.50						165.50
Foods, alcohols and beverages		22	59		248.00	298.00					248.00	298.00
Miscellaneous chemical analyses and examinations			3			30.00						30.00
Miscellaneous biological works and examinations	11			33.00						33.00		
Antirinderpest serum	553,666.33	127,499.97	134,333.33				757.15	218.58	230.29	757.15	218.58	230.29
Mallein	37	200	300				3.70	20.00	30.00	3.70	20.00	30.00
Miscellaneous sera and preparations		1,000						1.00			1.00	
Photographic work	278	25	17				85.60	19.40	3.40	85.60	19.40	3.40
Total	553,992.33	128,748.97	134,759.33	33.00	270.00	795.50	846.45	258.98	263.69	879.45	528.98	1,059.19

TABLE II.—*Comparative table of routine work performed and supplies manufactured and disposed of, etc.*—Continued.

Patron.	Samples or units.			Free.			Cash.			Total.		
	Fiscal year 1913.	Six months ended Dec. 31, 1913.	Calendar year 1914.	Fiscal year 1913.	Six months ended Dec. 31, 1913.	Calendar year 1914.	Fiscal year 1913.	Six months ended Dec. 31, 1913.	Calendar year 1914.	Fiscal year 1913.	Six months ended Dec. 31, 1913.	Calendar year 1914.
Bureau of Coast and Geodetic Survey.												
Waters:				*Pesos.*	*Pesos.*	*Pesos.*	*Pesos.*	*Pesos.*	*Pesos.*	*Pesos.*	*Pesos.*	*Pesos.*
Chemical		1			15.00						15.00	
Biological		1			40.00						40.00	
Total		2			55.00						55.00	
Committee on Infant Mortality.												
Foods, alcohols and beverages		70						2,086.00			2,086.00	
Photographic work		23						64.00			64.00	
Total		93						2,150.00			2,150.00	
Consulting Architect.												
Photographic work	24						17.70			17.70		
Bureau of Customs.												
Metals and alloys	7	4	1	49.00	21.00	8.00				49.00	21.00	8.00
Fertilizers		1			15.00						15.00	
Soils and similar substances	3			9.00						9.00		
Waters, chemical			1			5.00						5.00
Waters, biological			42			1,860.00						1,860.00 *
Crude chemical and miscellaneous analyses		2	5		11.00	22.50					11.00	22.50
Standard solutions		3						15.00			15.00	

Standardization of units of measures:												
Weights	7						3.50			3.50		
Miscellaneous	8						0.80			0.80		
Petroleum and products, copra, and similar materials	2			20.00						20.00		
Paints, varnishes, and linseed oils	6		1	3.00		3.50	16.00			19.00		3.50
Gums, resins, and similar materials	1			10.00						10.00		
Paper and similar materials	1	5	1	2.00	50.00	10.00				2.00	50.00	10.00
Foods, alcohols and beverages	7	1	7	31.00	15.00	92.00				31.00	15.00	92.00
Medicines and similar articles	42	9	1	206.00	85.00	10.00				206.00	85.00	10.00
Miscellaneous chemical analyses and examinations		1			5.00						5.00	
Photographic work	16						35.50			35.50		
Total	100	26	59	330.00	202.00	2,011.00	55.80	15.00		385.80	217.00	2,011.00
Bureau of Education.												
Physical tests of wire, twine, fiber, textile, paper, and similar articles	3	2					12.00	8.00		12.00	8.00	
Standardization of road materials	1						15.00			15.00		
Paper and similar materials	6			18.00						18.00		
Photographic work	2,108	1,302	1,799				584.40	259.90	347.30	584.40	259.90	347.30
Shop work	1						2.15			2.15		
Miscellaneous work	6			30.00						30.00		
Total	2,125	1,304	1,799	48.00			613.55	267.90	347.30	661.55	267.90	347.30
Electrolysis Committee.												
Metals and alloys	5						63.60			63.60		
Executive Bureau.												
Photographic work	1,338	24	135				502.90	40.80	62.17	502.90	40.80	62.17

TABLE II.—*Comparative table of routine work performed and supplies manufactured and disposed of, etc.*—Continued.

Patron.	Samples or units.			Free.			Cash.			Total.		
	Fiscal year 1913.	Six months ended Dec. 31, 1913.	Calendar year 1914.	Fiscal year 1913.	Six months ended Dec. 31, 1913.	Calendar year 1914.	Fiscal year 1913.	Six months ended Dec. 31, 1913.	Calendar year 1914.	Fiscal year 1913.	Six months ended Dec. 31, 1913.	Calendar year 1914.
Bureau of Forestry.				*Pesos.*	*Pesos.*	*Pesos.*	*Pesos.*	*Pesos.*	*Pesos.*	*Pesos.*	*Pesos.*	*Pesos.*
Coal analyses	1			15.00						15.00		
Calorimetric test of fuels	1			20.00						20.00		
Petroleum and products, copra, and similar materials			2			30.00						30.00
Miscellaneous chemical analyses and examinations		1						6.00			6.00	
Photographic work	263	362	882				52.20	300.20	227.17	52.20	300.20	227.17
Total	265	363	884	35.00		30.00	52.20	306.20	227.17	87.20	306.20	257.17
Bureau of Health.												
Metals and alloys			1			3.00						3.00
Clays, shales, limestones, limes, wall plasters, cements, and slags			1			3.00						3.00
Waters:												
Chemical	54	30	36	860.00	850.00	725.00				860.00	850.00	725.00
Biological	860	1,105	1,042	34,435.00	44,250.00	41,520.00				34,435.00	44,250.00	41,520.00
Crude chemical and miscellaneous analyses			3			11.00						11.00
Standard solutions		7						347.00			347.00	
Urines, clinical and toxicological analyses	7,563	60	146	21,367.00	202.00	600.00	1,383.00			22,750.00	202.00	600.00
Essential oils and essences			1			15.00						15.00

Petroleum and products, copra, and similar materials	1	--------	--------	5.00	--------	--------	--------	--------	--------	5.00	--------	--------
Paints, varnishes, and linseed oils	1	--------	2	25.00	--------	30.00	--------	--------	--------	25.00	--------	30.00
Gastric juice, clinical examinations	12	19	49	250.00	270.00	540.00	75.00	15.00	--------	325.00	285.00	540.00
Foods, alcohols and beverages	679	173	215	9,329.00	2,506.00	2,433.00	--------	--------	--------	9,329.00	2,506.00	2,433.00
Food preservatives and coloring matters	15	6	3	100.00	180.00	45.00	--------	--------	--------	100.00	180.00	45.00
Medicines and similar articles	31	25	13	330.00	260.00	175.00	--------	--------	--------	330.00	260.00	175.00
Miscellaneous chemical analyses and examinations	--------	9	30	--------	55.00	126.00	--------	--------	--------	--------	55.00	126.00
Fæces	10,456	12,144	51,736	78,839.00	221,944.00	1,231,693.00	925.00	228.00	242.00	79,764.00	222,172.00	1,231,935.00
Sputum	598	388	393	1,682.00	1,122.00	1,161.00	69.00	44.00	18.00	1,751.00	1,166.00	1,179.00
Blood	11,255	4,060	4,393	35,273,00	14,174.00	16,209.00	1,558.00	369.00	404.00	36,831.00	14,543.00	16,613.00
Blood culture	--------	184	390	--------	895.00	1,940.00	--------	35.00	10.00	--------	930.00	1,950.00
Widal test	--------	314	588	--------	942.00	1,752.00	--------	--------	12.00	--------	942.00	1,764.00
Wassermann test	--------	716	878	--------	6,910.00	8,620.00	--------	250.00	160.00	--------	7,160.00	8,780.00
Leprosy	--------	234	1,108	--------	702.00	3,324.00	--------	--------	--------	--------	702.00	3,324.00
Urines	--------	3,527	3,087	--------	10,134.00	9,027.00	--------	459.00	237.00	--------	10,593.00	9,264.00
Gonococci	20,519	8,492	16,319	54,312.00	25,473.00	48,957.00	9.00	3.00	--------	54,321.00	25,476.00	48,957.00
Necropsies	74	130	372	2,150.00	3,250.00	9,300.00	--------	--------	--------	2,150.00	3,250.00	9,300.00
Histological examinations	--------	317	243	--------	3,160.00	2,430.00	--------	10.00	--------	--------	3,170.00	2,430.00
Rabies	--------	14	30	--------	--------	--------	--------	--------	--------	--------	--------	--------
Plague	--------	12	43	--------	36.00	129.00	--------	--------	--------	--------	36.00	129.00
Rats for plague	--------	27,384	113,288	--------	82,152.00	339,864.00	--------	--------	--------	--------	82,152.00	339,864.00
Miscellaneous biological work and examinations	57,170	774	1,638	170,785.00	2,461.00	8,355.00	--------	6.00	28.00	170,785.00	2,467.00	8,383.00
Vaccine virus	2,405,115	1,321,124	2,537,800	--------	--------	--------	28,042.41	13,211.24	25,378.00	28,042.41	13,211.24	25,378.00
Miscellaneous sera and preparations	1,644,255	1,057,050	4,956,287	--------	--------	--------	3,166.36	4,033.90	10,645.57	3,166.36	4,033.90	10,645.57
Photographic work	1,387	587	1,363	--------	--------	--------	1,538.43	925.20	1,338.73	1,538.43	925.20	1,338.73
Shop work	67	30	13	--------	--------	--------	142.40	77.58	29.73	142.40	77.58	29.73
Total	4,160,112	2,438,915	7,691,511	409,742.00	421,928.00	1,728,987.00	36,908.60	20,013.92	38,503.03	446,650.60	441,941.92	1,767,490.03

TABLE II.—*Comparative table of routine work performed and supplies manufactured and disposed of, etc.*—Continued.

Patron.	Samples or units.			Free.			Cash.			Total.		
	Fiscal year 1913.	Six months ended Dec. 31, 1913.	Calendar year 1914.	Fiscal year 1913.	Six months ended Dec. 31. 1913.	Calendar year 1914.	Fiscal year 1913.	Six months ended Dec. 31, 1913.	Calendar year 1914.	Fiscal year 1913.	Six months ended Dec. 31, 1913.	Calendar 1914.
Bureau of Internal Revenue.				*Pesos.*	*Pesos.*	*Pesos.*	*Pesos.*	*Pesos.*	*Pesos.*	*Pesos.*	*Pesos.*	*Pesos.*
Standardization of weights			25						2.50			2.50
Foods, alcohols and beverages	15	13		375.00	550.00					375.00	550.00	
Medicines and similar articles	135	5	4	665.00	25.00	40.00				665.00	25.00	40.00
Miscellaneous chemical analyses and examinations	2			20.00						20.00		
Total	152	18	29	1,060.00	575.00	40.00			2.50	1,060.00	575.00	42.50
Bureau of Justice.												
Water, chemical		2						26.00			26.00	
Urines, clinical and toxicological analyses		1	12					75.00	220.00		75.00	220.00
Medicines and similar articles	5		13				25.00		85.00	25.00		85.00
Blood	1	1					3.00	75.00		3.00	75.00	
Miscellaneous biological work and examinations			3						155.00			155.00
Total	6	4	28				28.00	176.00	460.00	28.00	176.00	460.00
Bureau of Lands.												
Soils and similar substances	5			150.00						150.00		
Crude chemical and miscellaneous analyses	1			20.00						20.00		

Assays	1			2.00						2.00		
Total	7			172.00						172.00		
Bureau of Navigation.												
Coal analyses	1			15.00						15.00		
Cements	1	11					5.00	170.60		5.00	170.60	
Compression, tensile, or transverse strength of concrete, stone, mortar, rope, iron, and steel		66						11.50			11.50	
Standardization of road materials	2						14.00			14.00		
Petroleum and products, copra, and similar materials	1			7.00						7.00		
Food preservatives and coloring matters	1			15.00						15.00		
Water:												
Chemical		7			35.00						35.00	
Biological	5	7		200.00	280.00					200.00	280.00	
Total	11	190		237.00	315.00		19.00	182.10		256.00	497.10	
Philippine Constabulary.												
Physical test of wire, twine, fiber, textile, paper, and similar articles	2	14	2				8.00	58.00	8.50	8.00	58.00	8.50
Fæces	5	5		37.00	15.00					37.00	15.00	
Sputum	11	8	1	24.00	24.00	3.00				24.00	24.00	3.00
Blood	3	1		153.00	75.00					153.00	75.00	
Wassermann reaction			1			10.00						10.00
Histological examinations		1			10.00						10.00	
Vaccine virus	34	2,000	2,150				0.34	20.00	21.50	0.34	20.00	21.50
Miscellaneous sera and preparations		150						60.00			60.00	
Total	55	2,179	2,154	214.00	124.00	13.00	8.34	138.00	30.00	222.34	262.00	43.00

TABLE II.—*Comparative table of routine work performed and supplies manufactured and disposed of, etc.*—Continued.

Patron.	Samples or units.			Free.			Cash.			Total.		
	Fiscal year 1913.	Six months ended Dec. 31, 1913.	Calendar year 1914.	Fiscal year 1913.	Six months ended Dec. 31, 1913.	Calendar year 1914.	Fiscal year 1913.	Six months ended Dec. 31, 1913.	Calendar year 1914.	Fiscal year 1913.	Six months ended Dec. 31, 1913.	Calendar year 1914.
Philippine Exposition Board.				*Pesos.*	*Pesos.*	*Pesos.*	*Pesos.*	*Pesos.*	*Pesos.*	*Pesos.*	*Pesos.*	*Pesos.*
Photographic work	242		130				48.40		173.07	48.40		173.07
Shop work			20						522.59			522.59
Total	242		150				48.40		695.66	48.40		695.66
Philippine Library.												
Photographic work	60						13.80			13.80		
Bureau of Printing.												
Petroleum and products, copra, and similar materials	21			6.00						6.00		
Paper and similar materials	99	89	100	1,200.00	890.00	1,000.00				1,200.00	890.00	1,000.00
Miscellaneous chemical analyses and examinations		1			15.00						15.00	
Assays	1			6.00						6.00		
Photographic work	13						72.20			72.20		
Total	134	90	100	1,212.00	905.00	1,000.00	72.20			1,284.20	905.00	1,000.00
Bureau of Prisons.												
Soils and similar substances			1			30.00						30.00
Urines, clinical and toxicological analyses	2,024			6,072.00						6,072.00		
Foods, alcohols and beverages	1			3.00						3.00		
Miscellaneous chemical analyses and examinations	5			5.00						5.00		

Waters:												
Chemical		1			15.00						15.00	
Biological	34	13		750.00	520.00					750.00	520.00	
Fæces	18,452	9,410	67,183	55,730.00	28,230.00	1,455,989.00				55,730.00	28,230,00	1,455,989.00
Sputum	5,155	1,515	1,671	15,465.00	4,545.00	5,013.00				15,465.00	4,545.00	5,013.00
Blood	14,169	4,709	1,999	42,528.00	14,127.00	5,997.00				42,528.00	14,127.00	5,997.00
Widal test		2	6		6.00	18.00					6.00	18.00
Wassermann test		4	92		40.00	920.00					40.00	920.00
Leprosy		9	19		27.00	57.00					27.00	57.00
Urines		1,781	1,186		5,343.00	3,558.00					5,343.00	3,558.00
Gonococci		46	36		138.00	108.00					138.00	108.00
Necropsies	13	12	29	350.00	300.00	725.00				350.00	300.00	725.00
Histological examinations		2	5		20.00	50.00					20.00	50.00
Plague		1	1		3.00	3.00					3.00	3.00
Rats for plague		28	10		84.00	30.00					84.00	30.00
Miscellaneous biological work and examinations	108	17	61	241.00	51.00	191.00				241.00	51.00	191.00
Miscellaneous sera and preparations		25						25.00			25.00	
Total	39,961	17,575	72,299	121,144.00	53,449.00	1,472,689.00		25.00		121,144.00	53.474.00	1,472,689.00
Bureau of Public Works.												
Metals and alloys	1		3	4.00		20.00				4.00		20.00
Coal analyses			1			15.00						15.00
Crude chemical and miscellaneous analyses	7						104.00			104.00		
Cements	3,889	1,832	1,587				4,250.20	2,784.80	2,306.80	4,250.20	2,784.80	2,306.80
Compression, tensile, or transverse strength of concrete, stone, mortar, rope, iron, and steel	15		22				50.00		64.00	50.00		64.00
Standardization of road materials	20		7				200.50		87.65	200.50		87.65
Paints, varnishes, and linseed oils	1		4				9.00		36.00	9.00		36.00

TABLE II.—*Comparative table of routine work performed and supplies manufactured and disposed of, etc.*—Continued.

Patron.	Samples or units.			Free.			Cash.			Total.		
	Fiscal year 1913.	Six months ended Dec. 31, 1913.	Calendar year 1914.	Fiscal year 1913.	Six months ended Dec. 31, 1913.	Calendar year 1914.	Fiscal year 1913.	Six months ended Dec. 31, 1913.	Calendar year 1914.	Fiscal year 1913.	Six months ended Dec. 31, 1913.	Calendar year 1914,
Bureau of Public Works—Contd.				*Pesos.*	*Pesos.*	*Pesos.*	*Pesos.*	*Pesos.*	*Pesos.*	*Pesos.*	*Pesos.*	*Pesos.*
Miscellaneous chemical analyses and examinations	1		1	2.50		33.00				2.50		33.00
Waters:												
Chemical	95	72	139	3,595.00	2,880.00	2,800.00				3,595.00	2,880.00	2,800.00
Biological	70	74	113	3,240.00	2,960.00	4,400.00				3,240.00	2,960.00	4,400.00
Photographic work	219	495					188.80	372.15		188.80	372.15	
Total	4,318	2,473	1,877	6,841.50	5,840.00	7,268.00	4,802.50	3,156.95	2,494.45	11,644.00	8,996.95	9,762.45
Bureau of Quarantine Service.												
Compression, tensile, or transverse strength of concrete, stone, mortar, rope, iron, and steel	2						14.00			14.00		
Urine, clinical and toxicological analyses	3			7.00						7.00		
Fæces	5,545	2,726	6,762	138,581.00	68,150.00	169,050.00				138,581.00	68,150.00	169,050.00
Sputum	2			6.00						6.00		
Blood	2			6.00						6.00		
Leprosy			2			6.00						6.00
Plague			3			9.00						9.00
Rats for plague		152	39		456.00	117.00					456.00	117.00
Miscellaneous biological work and examinations	683			2,055.00						2,055.00		

Vaccine virus	7,600	1,700	6,350				76.00	17.00	63.50	76.00	17.00	63.50
Total	13,837	4,578	13,156	140,655.00	68,606.00	169,182.00	90.00	17.00	63.50	140,745.00	68,623.00	169,245.50
Bureau of Science.												
Metals and alloys	5	1	8	88.50	20.00	43.00				88.50	20.00	43.00
Rocks, minerals, natural pigments, and similar substances	12	3		129.50	24.00					129.50	24.00	
Clays, shales, limestones, limes, wall plasters, cements, and slags	21	25	5	354.00	199.60	115.00				354.00	199.60	115.00
Coal analyses			2			30.00						30.00
Calorimetric tests of fuels		2	1		40.00	20.00					40.00	20.00
Crude chemical and miscellaneous analyses	4	1	2	15.25	5.00	30.00				15.25	5.00	30.00
Standard solutions	7	14	25	35.00	136.00	167.00				35.00	136.00	167.00
Physical test of wire, twine, fibers, textiles, paper, and similar articles	1			4.00						4.00		
Compression, tensile, or transverse strength of concrete, stone, mortar, rope, iron and steel, etc	3	7		3.00	14.00					3.00	14.00	
Standardization of road materials	16			99.50						99.50		
Standardization of units of measures; miscellaneous		19			1.90						1.90	
Urine, clinical and toxicological analyses	1			3.00						3.00		
Petroleum and products, copra, and similar materials	10	1	15	187.50	20.00	75.00				187.50	20.00	75.00
Paints, varnishes, and linseed oils	3			26.00						26.00		
Paper and similar materials			3			30.00						30.00

TABLE II.—*Comparative table of routine work performed and supplies manufactured and disposed of, etc.*—Continued.

Patron.	Samples or units.			Free.			Cash.			Total.		
	Fiscal year 1913.	Six months ended Dec. 31, 1913.	Calendar year 1914.	Fiscal year 1913.	Six months ended Dec. 31, 1913.	Calendar year 1914.	Fiscal year 1913.	Six months ended Dec. 31, 1913.	Calendar year 1914.	Fiscal year 1913.	Six months ended Dec. 31, 1913.	Calendar year 1914.
Bureau of Science—Continued.				*Pesos.*	*Pesos.*	*Pesos.*	*Pesos.*	*Pesos.*	*Pesos.*	*Pesos.*	*Pesos.*	*Pesos.*
Foods, alcohols and beverages	127			1,270.00						1,270.00		
Miscellaneous chemical analyses and examinations	19	2		35.00	15.00					35.00	15.00	
Waters:												
Chemical	6	2	9	105.00	80.00	145.00				105.00	80.00	145.00
Biological	61	4	399	2,440.00	160.00	15,960.00				2,440.00	160.00	15,960.00
Assays	26		8	8.00		19.00				8.00		19.00
Fæces			73			1,825.00						1,825.00
Blood	1			10.00						10.00		
Rabies			5									
Miscellaneous biological work and examinations			1			5.00						5.00
Photographic work	681	275	1,822	1,056.10	76.30	593.00				1,056.10	76.30	593.00
Shop work	156	147	150	2,582.32	1,050.13	1,212.16				2,582.32	1,050.13	1,212.16
Total	1,160	503	2,528	8,451.67	1,841.93	20,269.16				8,451.67	1,841.93	20,269.16
Bureau of Supply.												
Metals and alloys	5		6	43.00		24.00				43.00		24.00
Rocks, minerals, natural pigments, and similar substances	1			10						10.00		
Coal analyses	39			585.00						585.00		
Calorimetric tests of fuels	23			460.00						460.00		

Crude chemical and miscellaneous analyses	7	4	20	30.00	40.00	181.00	108			138.00	40.00	181.00
Standard solutions		1						1.50			1.50	
Physical tests of wire, twine, fibers, textiles, paper, and similar materials	27		29				106.00		82.00	106.00		82.00
Cements	5,379	2,838	4,888				3,564.00	2,642.00	4,190.00	3,564.00	2,642.00	4,190.00
Compression, tensile, or transverse strength of concrete, stone, mortar, rope, iron and steel, etc	13	15	5				52.00	12.00	8.00	52.00	12.00	8.00
Standardization of road materials		1	1					15.00	15.00		15.00	15.00
Standardization of units of measures:												
Lengths	96	349	171			0.10	67.20	245.50	88.50	67.20	245.50	88.60
Capacities	150	31	308	15.00				18.00	88.70	15.00	18.00	88.70
Weights	660	890	751	66.00				89.00	77.45	66.00	89.00	77.45
Miscellaneous	202	26	28	2.50				7.50	12.00	2.50	7.50	12.00
Essential oils and essences	1	1		15.00	7.50					15.00	7.50	
Petroleum and products, copra, and similar materials	20	7	3	140.00	48.00	47.00				140.00	48.00	47.00
Paints, varnishes, and linseed oils	27	31	17	15.00		15.00	178.50	142.50	145.00	193.50	142.50	160.00
Paper and similar materials	1			3.00						3.00		
Foods, alcohols and beverages	13	24	45	96.00	72.00	171.00				96.00	72.00	171.00
Medicines and similar articles	8		4	75.00		30.00				75.00		30.00
Miscellaneous chemical analyses and examinations		1	10		5.00	77.00					5.00	77.00
Water:												
Chemical	15	1	8	225.00	15.00	120.00				225.00	15.00	120.00
Biological	20		12	750.00		480.00				750.00		480.00
Miscellaneous biological work and examinations	2		1	20.00		50.00				20.00		50.00

TABLE II.—*Comparative table of routine work performed and supplies manufactured and disposed of, etc.*—Continued.

Patron.	Samples or units.			Free.			Cash.			Total.		
	Fiscal year 1913.	Six months ended Dec. 31, 1913.	Calendar year 1914.	Fiscal year 1913.	Six months ended Dec. 31, 1913.	Calendar year 1914.	Fiscal year 1913.	Six months ended Dec. 31, 1913.	Calendar year 1914.	Fiscal year 1914.	Six months ended Dec. 31, 1913.	Calendar year 1914.
Bureau of Supply—Continued.				*Pesos.*	*Pesos.*	*Pesos.*	*Pesos.*	*Pesos.*	*Pesos.*	*Pesos.*	*Pesos.*	*Pesos.*
Vaccine virus		3,000						90.00			90.00	
Mallein		20	6					2.00	6.00		2.00	6.00
Miscellaneous sera and preparations	20,000		60,000				20.00		60.00	20.00		60.00
Total	26,709	7,240	66,313	2,550.50	187.50	1,195.10	4,095.70	3,265.00	4,772.65	6,646.20	3,452.50	5,967.75
The Sales Agency.												
Photographic work	12						2.40			2.40		
University of the Philippines.												
Standard solutions			2						2.00			2.00
Urine, clinical and toxicological analyses	5			15.00						15.00		
Foods, alcohols and beverages	9	18		90.00				36.67		90.00	36.67	
Fæces		180	126		4,500.00	3,150.00					4,500.00	3,150.00
Rabies			1									
Plague			18			54.00						54.00
Miscellaneous biological work and examinations	4			9.00						9.00		
Miscellaneous sera and preparations	34	20,000					2.00	20.00		2.00	20.00	
Photographic work	651	104	480				386.66	67.00	219.15	386.66	67.00	219.15
Shop work	1	28	7				3.55	53.62	45.76	3.55	53.62	45.76
Total	704	20,330	634	114.00	4,500.00	3,204.00	392.21	177.29	266.91	506.21	4,677.29	3,470.91

Weather Bureau.												
Photographic work	62						12.40			12.40		
City of Manila.												
Clays, shales, limestone, limes, wall plasters, cements, and slags			2						6.00			6.00
Crude chemical and miscellaneous analyses	2	1	7				45.40	15.00	78.00	45.40	15.00	78.00
Cements	15	84	119				50.00	319.80	445.20	50.00	319.80	445.20
Standardization of road materials	3		1				25.00		15.00	25.00		15.00
Foods, alcohols and beverages		2						20.00			20.00	
Medicines and similar articles	6						30.00			30.00		
Miscellaneous chemical analyses and examinations		1	1					10.00	10.00		10.00	10.00
Blood	2	6					225.00	450.00		225.00	450.00	
Waters, biological			627			19,590.00						19,590.00
Miscellaneous biological work and examinations	1		5				25.00		68.00	25.00		68.00
Mallein			6						6.00			6.00
Miscellaneous sera and preparations	141,000	80,500	189,040				141.00	80.50	193.00	141.00	80.50	193.00
Photographic work		6						19.50			19.50	
Total	141,029	80,600	189,808			19,590.00	541.40	914.80	821.20	541.40	914.80	20,411.20
Provinces and municipalities.												
Metals and alloys			1						48.00			48.00
Rocks, minerals, natural pigments, and similar substances	1						17.00			17.00		
Soils and similar substances	1						5.00			5.00		
Crude chemical and miscellaneous analyses			2						14.00			14.00

TABLE II.—*Comparative table of routine work performed and supplies manufactured and disposed of, etc.*—Continued.

Patron.	Samples or units.			Free.			Cash.			Total.		
	Fiscal year 1913.	Six months ended Dec. 31, 1913.	Calendar year 1914.	Fiscal year 1913.	Six months ended Dec. 31, 1913.	Calendar year 1914.	Fiscal year 1913.	Six months ended Dec. 31, 1913.	Calendar year 1914.	Fiscal year 1913.	Six months ended Dec. 31, 1913.	Calendar year 1914.
Provinces and municipalities—Continued.				*Pesos.*	*Pesos.*	*Pesos.*	*Pesos.*	*Pesos.*	*Pesos.*	*Pesos.*	*Pesos.*	*Pesos.*
Cements	113	5	38				301.45	19.35	142.50	301.45	19.35	142.50
Compression, tensile, or transverse strength of concrete, stone, mortar, rope, iron and steel, etc	15	22	11				43.00	39.00	53.00	43.00	39.00	53.00
Standardization of road materials	10		6				114.00		52.50	114.00		52.50
Medicines and similar articles	4	1	1				5.00	10.00	10.00	5.00	10.00	10.00
Water:												
Chemical	3	3	1				95.00	120.00	40.00	95.00	120.00	40.00
Biological	3	2	1				120.00	80.00	40.00	120.00	80.00	40.00
Vaccine virus	3,800	2,100	65,250				114.00	63.00	3,077.50	114.00	63.00	3,077.50
Miscellaneous sera and preparations	33,000						84.60			84.60		
Photographic work		20	37					3.30	27.20		8.30	27.20
Total	36,950	2,153	65,348				899.05	339.65	3,504.70	899.05	339.65	3,504.70
United States Army and Navy.												
Metals and alloys	3		3				37.00		80.00	37.00		80.00
Clays, shales, limestones, limes, wall plasters, cements, and slags	2						10.00			10.00		
Coal analyses	1	1	11				15.00	6.00	151.00	15.00	6.00	151.00

Calorimetric tests of fuels		4	3					86.00	60.00		86.00	60.00
Waters, chemical	2		1				30.00		40.00	30.00		40.00
Standard solutions	3						10.00			10.00		
Physical tests of wire, twine, fibers, textiles, paper, and similar articles	30						39.00			39.00		
Cements	120	202	126				823.90	324.40	308.00	823.90	324.40	308.00
Compression, tensile, or transverse strength of concrete, stone, mortar, rope, iron and steel, etc	7						24.00			24.00		
Standardization of road materials	1						5.00			5.00		
Urine, clinical and toxicological analyses			2						50.00			50.00
Essential oils and essences	6						54.00			54.00		
Petroleum and products, copra, and similar materials	9		1				133.00		16.00	133.00		16.00
Paints, varnishes, and linseed oils			14						108.00			108.00
Foods, alcohols and beverages	18	3	7	170.00			98.00	13.00	96.00	268.00	13.00	96.00
Medicines and similar articles	9						8.00			8.00		
Miscellaneous chemical analyses and examinations	11	2					82.00	50.00		82.00	50.00	
Blood cultures		1						3.00			3.00	
Vaccine virus	14,064	7,324	22,172				478.90	254.40	717.80	478.90	254.40	717.80
Mallein	240	491	328				240.00	491.00	328.00	240.00	491.00	328.00
Miscellaneous sera and preparations	573,608	245,831	528,831				887.30	1,112.00	2,184.35	887.30	1,112.00	2,184.35
Photographic work	5						30.00			30.00		
Shop work			1						5.18			5.18
Miscellaneous work		2						1.00			1.00	
Total	588,139	253,861	551,500	170.00			3,005.10	2,340.80	4,144.33	3,175.10	2,340.80	4,144.33

TABLE II.—*Comparative table of routine work performed and supplies manufactured and disposed of, etc.*—Continued.

Patron.	Samples or units.			Free.			Cash.			Total.		
	Fiscal year 1913.	Six months ended Dec. 31, 1913.	Calendar year 1914.	Fiscal year 1913.	Six months ended Dec. 31, 1913.	Calendar year 1914.	Fiscal year 1913.	Six months ended Dec. 31, 1913.	Calendar year 1914.	Fiscal year 1913.	Six months ended Dec. 31, 1913.	Calendar year 1914.
Miscellaneous.				*Pesos.*	*Pesos.*	*Pesos.*	*Pesos.*	*Pesos.*	*Pesos.*	*Pesos.*	*Pesos.*	*Pesos.*
Metals and alloys	19	9	28	----------	----------	----------	172.50	58.51	308.50	172.50	58.51	308.50
Rocks, minerals, natural pigments, and similar substances	1	----------	----------	----------	----------	----------	3.00	----------	----------	3.00	----------	----------
Clays, shales, limestones, limes, wall plasters, cements, and slags	31	6	3	----------	----------	----------	255.50	60.00	21.00	255.50	60.00	21.00
Fertilizers	11	7	12	----------	----------	----------	108.00	59.00	132.00	108.00	59.00	132.00
Soils and similar substances	2	5	30	----------	----------	----------	30.00	45.00	693.00	30.00	45.00	693.00
Coal analyses	16	2	8	----------	----------	----------	158.00	23.00	125.00	158.00	23.00	125.00
Calorimetric tests of fuels	7	1	3	----------	----------	----------	140.00	20.00	60.00	140.00	20.00	60.00
Crude chemical and miscellaneous analyses	5	6	49	----------	----------	----------	49.00	122.00	197.50	49.00	122.00	197.50
Standard solutions	----------	3	3	----------	----------	----------	----------	19.00	27.00	----------	19.00	27.00
Cements	38	22	59	----------	----------	----------	134.50	95.90	243.70	134.50	95.90	248.70
Compression, tensile, or transverse strength of concrete, stone, mortar, rope, iron and steel	6	26	48	----------	----------	----------	85.00	86.00	205.00	85.00	86.00	205.00
Standardization of road materials, etc	7	----------	----------	----------	----------	----------	42.00	----------	----------	42.00	----------	----------

Standardization of units of measures:											
Capacities	4		4				4.00		10.70	4.00		10.70
Miscellaneous	5	6	13				10.00	24.00	42.00	10.00	24.00	42.00
Urines, clinical and toxicological analyses	47	21	63				130.00	81.00	199.00	130.00	81.00	199.00
Essential oils and essences	30	16	13				219.00	120.00	89.50	219.00	120.00	89.50
Petroleum and products, copra, and similar materials	7	2	10				44.50	90.00	73.50	44.50	90.00	73.50
Paints, varnishes, and linseed oils	9	2	3				124.00	30.00	30.00	124.00	30.00	30.00
Gums, resins, and similar materials	2	8					10.00	29.00		10.00	29.00	
Gastric juice, clinical examinations			3						15.00			15.00
Foods, alcohols and beverages	166	114	249				816.50	1,004.70	788.00	816.50	1,004.70	788.00
Food preservatives and coloring matters	3	1	2				14.00	6.00	4.00	14.00	6.00	4.00
Medicines and similar articles	3	3	2				25.00	15.00	45.00	25.00	15.00	45.00
Miscellaneous chemical analyses and examinations	14	3	23				96.00	29.00	90.00	96.00	29.00	90.00
Assays	279	219	403				598.67	360.50	653.45	598.67	360.50	653.45
Waters:												
Chemical	19	7	13				515.00	185.00	285.00	515.00	185.00	285.00
Biological	17	5	2				630.00	210.00	280.00	630.00	210.00	280.00
Fæces	72	37	346				222.00	113.00	1,129.00	222.00	113.00	1,129.00
Sputum	14	8	30				42.00	24.00	90.00	42.00	24.00	90.00
Blood	108	3	6				1,030.00	9.00	18.00	1,030.00	9.00	18.00
Blood culture			2						10.00			10.00
Widal test			5						21.00			21.00
Wassermann test		78	288					780.00	2,880.00		780.00	2,880.00
Leprosy			3						9.00			9.00
Urines		1	2					10.00	5.00		10.00	5.00
Gonococci	3	3	24				9.00	9.00	72.00	9.00	9.00	72.00

TABLE II.—*Comparative table of routine work performed and supplies manufactured and disposed of, etc.*—Continued.

Patron.	Samples or units.			Free.			Cash.			Total.		
	Fiscal year 1913.	Six months ended Dec. 31, 1913.	Calendar year 1914.	Fiscal year 1913.	Six months ended Dec. 31, 1913.	Calendar year 1914.	Fiscal year 1913.	Six months ended Dec. 31, 1913.	Calendar year 1914.	Fiscal year 1913.	Six months ended Dec. 31, 1913.	Calendar year 1914.
Miscellaneous—Continued.				*Pesos.*	*Pesos.*	*Pesos.*	*Pesos.*	*Pesos.*	*Pesos.*	*Pesos.*	*Pesos.*	*Pesos.*
Histological examinations		2	8					20.00	80.00		20.00	80.00
Miscellaneous biological work and examinations	8	5	46				60,00	20.00	297.50	60.00	20.00	297.00
Vaccine virus	3,174	421	2,613				163.90	20.90	124.75	163.90	20.90	124.75
Mallein	2		175				2.00		175.50	2.00		175.50
Miscellaneous sera and preparations	407,321	333,215	789,932				986.71	954.90	1,926.90	986.71	954.90	1,926.90
Photographic work	7,077	5,650	9,496				3,634.30	2,483.35	2,558.35	3,634.30	2,483.35	2,558.35
Natural history specimens	84	1	8				127.60	2.00	81.24	127.60	2.00	81.24
Shop work	24	13	17				58.49	107.30	550.97	58.49	107.30	550.97
Miscellaneous work	34	26	52				152.14	5,028.60	8,081.52	152.14	5,028.60	8,081.52
Sales of publications							6,364.71	1,881.14	3,433.16	6,364.71	1,881.14	3,433.16
Refunded, work not done, etc. (deducted)							(137.00)	(438.81)	(82.75)	(137.00)	(438.81)	(82.75)
Power, gas, etc							34,265.70	16,907.03	31,995.70	34,265.70	16,907.03	31,995.70
Reimbursement of traveling expenses, etc							393.60			393.60		
Total	418,669	339,957	804,104				51,789.32	30,704.02	58.079.19	51,789.32	30,704.02	58,079.19
Grand total	5,990,178.33	3,301,226.97	9,599,175.33	693,009.67	558,798.43	3,426,273.76	104,880.62	64,489.41	114,738.45	797,890.29	623,287.84	3,541,012.21

TABLE III.—*Comparative statement showing expenditures and income during the semifiscal year 1914 (July 1 to December 31, 1913) and during the new fiscal year 1914, as compared with the fiscal year 1913 (July 1, 1912, to June 30, 1913).*

EXPENDITURES.

Item.	Fiscal year 1913.	Semifiscal year 1914.	New fiscal year 1914.
Apparatus, supplies, etc.:	*Pesos.*	*Pesos.*	*Pesos.*
Miscellaneous supplies and chemicals	17, 189. 27	8, 212. 40	22, 873. 86
Apparatus	4, 430. 87	1, 567. 69	1, 762. 59
Supplies for power plant, oil, coal, etc	27, 722. 84	6, 062. 04	26, 885. 83
Small animals, feed, etc	2, 012. 39	515. 86	1, 076. 42
Large animals, feed, etc	4, 231. 49	2, 253. 72	5, 007. 18
Office supplies	3, 832. 58	1, 431. 80	2, 392. 18
Photographic supplies	3, 672. 46	1, 771. 83	2, 829. 48
Books, subscriptions, etc	8, 216. 35	5, 578. 19	9, 043. 03
Total	71, 308. 25	27, 393. 53	71, 870. 57
Transportation and freight, etc.:			
Transportation, travel expenses, per diems, launch hire, etc	13, 421. 20	3, 795. 68	10, 134. 90
City transportation	2, 175. 15	1, 271. 11	3, 453. 54
Freight	1, 134. 66	493. 17	980. 09
Total	16, 731. 01	5, 559. 96	14, 568. 53
Miscellaneous:			
Telephones and fire alarm boxes	1, 518. 09	802. 10	1, 458. 97
Postage, telegrams, and cablegrams	3, 181. 79	1, 208. 03	3, 473. 15
Repairs to apparatus, furniture, etc	828. 94	1, 035. 76	712. 92
Laundry	423. 21	267. 28	486. 22
Printing and binding	26, 024. 49	18, 269. 87	28, 695. 67
Advertising	931. 04	83. 46	268. 02
Incidentals, including operation of aquarium, building maintenance, etc	2, 075. 25	1, 260. 37	12, 299. 72
Museum specimens	4, 207. 94	4, 620. 45	19, 688. 18
Total	39, 190. 75	27, 547. 32	67, 082. 85
Salaries and wages:			
Salaries and wages	234, 083. 11	126, 176. 01	173, 729. 61
Transportation and expenses en route foreign country to Manila	3, 508. 35	4, 910. 13	624. 54
Accrued leave and half salary	20, 536. 28	49, 687. 27	50, 384. 12
Total	258, 127. 74	180, 773. 41	224, 738. 27
Grand total	385, 357. 75	241, 274. 22	378, 260. 22
Accounts payable and outstanding obligations paid during the year	69, 776. 87	43, 336. 63	51, 738. 13
	455, 134. 62	284, 610. 85	429, 998. 35

TABLE III.—*Comparative statement showing expenditures, etc.*—Continued.

INCOME.

Item.	Fiscal year 1913.	Semifiscal year 1914.	New fiscal year 1914.
	Pesos.	*Pesos.*	*Pesos.*
Receipts from operation	104,880.62	64,489.41	115,486.73
Prior year income	(51.57)	(1,843.83)	(838.20)
Sales of supplies	954.74	391.53	488.82
Sales of fixed assets	1,705.21	898.46	2,716.45
Deferred income		12,000.00	
Total	107,489.00	75,936.07	117,853.80
Appropriation account:			
Allotted or appropriated	240,000.00	323,000.00	381,084.00
Accounts payable	23,499.60	5,836.18	68,586.98
Brought forward or restored from previous fiscal years to cover contingent obligations	46,384.70	59,630.30	9,834.35
Total	409,884.30	388,466.48	459,505.33

MISCELLANEOUS ACCOUNTS.

Tiqui-tiqui distribution, Act No. 2376:	*Pesos.*
Available, Feb. 28, 1914	6,000.00
Expended	943.36
Balance	5,056.64
Public works: Alterations to boiler, sec. 4, Act No. 1989:	
Available, Jan. 1, 1914	7,031.64
Expended	6,237.64
Balance	794.00
Aquarium, sec. 4, Acts Nos. 1902 and 1989:	
Available, Jan. 1, 1914	55.91
Expended	55.91
Balance	
Library equipment, Act No. 1988:	
Available, Jan. 1, 1914	1,572.57
Expended	
Balance	1,572.57
Replacement fund:	
Available, Aug. 28, 1914	1,352.46
Expended	8.25
Balance	1,344.21
Guaranty fund:	
Applicable to accounts, Jan. 1, 1914	2,008.22
Applicable to accounts, Jan. 1, 1915	1,648.91

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